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The Manfestation of the African-Centered Educational Philosophy in the Pedagogical Practices of an Elementary Education Science Teacher

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This dissertation, THE MANIFESTATION OF THE AFRICAN-CENTERED EDUCATIONAL PHILOSOPHY IN THE PEDAGOGICAL PRACTICES OF AN ELEMENTARY EDUCATION SCIENCE TEACHER, by AKUA APPIAGYEI, was prepared under the direction of the candidate's Dissertation Advisory Committee. It is accepted by the committee members in partial fulfillment of the requirements for the degree, Doctor of Education, in the College of Education & Human Development, Georgia State University.

The Dissertation Advisory Committee and the student's Department Chairperson, as representatives of the faculty, certify that this dissertation has met all standards of excellence and scholarship as determined by the faculty.

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THE MANIFESTATION OF THE AFRICAN-CENTERED EDUCATIONAL PHILOSO-

PHY IN THE PEDAGOGICAL PRACTICES OF AN ELEMENTARY EDUCATION

SCIENCE TEACHER

By

AKUA APPIAGYEI

Under the Direction of Janice Fournillier

ABSTRACT

The educational difficulties faced by African-American students in American public schools have led to a quest for authentic solutions. These solutions have included a call for pedagogical practices that recognize and infuse students' culture into the learning environment. It is the case, however, that the acknowledgment of student culture is not evident in all classrooms, or in all disciplines. Many educators seem to misunderstand how to utilize student cultural identity to benefit student learning efficiently. The remedy might lie in providing more references for how student-centeredness for the African-American student can be implemented. This qualitative case study used an Afrocentric framework to link the discourse on culturally relevant teaching in mainstream schools with that of African-centered schools. I examined the practices of an elementary education science teacher in an African-centered school, and how she translated the African-centered curriculum into effective instructional methods, in a discipline as seemingly culture-neutral as science. The findings of this study are organized around the Afrocentric tenets of centrism, critical analysis and consciousness, and offer practical expressions of these tenets in the elementary science classroom. The findings suggest the importance of teacher mindset regarding centered pedagogical practices, and a need for teachers to prioritize their own knowledge

and consciousness regarding the history and current scientific concerns relevant to people of African-descent. There is clearly a need for an acknowledgement of the foundational quality of socio-political science education at the elementary level. Doing so may help to reconcile some of the difficulties educators experience in addressing the socio-political aspects of elementary science. This study can contribute to the strengthening, empowering, and promoting of agency within educators of African-American students in all educational contexts.

INDEX WORDS: Culturally relevant teaching, culturally relevant pedagogy, African-centered pedagogy, teacher pedagogical practices, Afrocentric education, socio-political science education

THE MANIFESTATION OF THE AFRICAN-CENTERED EDUCATIONAL PHILOSOPHY

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A Dissertation

Presented in Partial Fulfillment of the Requirements for the

Degree of

Doctor of Education

in

Curriculum and Instruction

in

Early Childhood Education

in

the College of Education and Human Development

Georgia State University

Atlanta, GA
2019

ACKNOWLEDGMENTS

First and foremost, I would like to thank my Lord and Savior Jesus Christ, whose I am, and by whose grace I am able to do ALL things.

I would also like to thank my committee chair, Dr. Janice Fournillier, for her patience, her time, her guidance, her wisdom, and her honesty throughout this process. Thank you Dr. Fournillier! I have learned so much from you, and I am forever grateful.

Thank you also to my dissertation committee members Dr. Joyce King, whose work continues to inspire me daily, and Dr. Yali Zhao, whose encouragement and kind words have always uplifted my spirit. I do not take for granted every second you have dedicated to my work. Thank you!

I also thank my mother and father, Charity Dwira and Robert Osei. I reap from your hard work and your many, many sacrifices. You have cheered me on, and willed good things for me. You have allowed me to be who I am, always, and instilled in me a love for people and a heart of service. You are, truly, an embodiment of who I hope to be for all my students. To you, and to all who do for their children as you have, I dedicate my work.

To the friends and family whose prayers kept me going— namely the Opoku-Akyeampong family, who are, in fact, the blessing and not the blessees—thank you. I especially acknowledge my sister friend Sylvia Barnes for her support, and her selfless ability to do for others. You cooked, cleaned and prayed for me through this process; the many times I could not find the energy to do these things for myself, you did. You are God-sent, and I appreciate you!

I would finally like to thank the administrators of the Asempa School (pseudonym), who so generously shared with me their amazing school, their brilliant students, and a view point that has forever changed the way I interact with my own students. To Auntie Eneola (pseudonym), in

whose classroom I had the privilege of learning, I also say thank you. Auntie Eneola, on behalf of all your students (including myself), I declare upon you the manifestation of every good thing your heart desires; Nyame nhyira wo!

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DEFINITION OF TERMS

Afrocentric: Afrocentric or any of its derivatives (Afrocentricity, Afrocentricity, Africentric) is "essentially a quality of perspective or approach rooted in the cultural image and human interest of African people" (Karenga, 1988, p. 404)

African American: The term African American in this study refers to Americans descended from black or African ancestry. It will be used interchangeably with the term "Black".

African-centered school: African-centered school, or African-centered institution, refers to an educational institution built on Afrocentric philosophies.

African-descent: African-descent refers to all people of African ancestry, situated on the continent of Africa or outside of the continent of Africa (i.e. Americas, Caribbean Islands, Europe, et cetera).

Centrism: Centrism refers to the prioritizing of an individual's culture, community, history, present and future well-being as the heart of all that concerns him or her.

Culture-based pedagogical theories: This study uses the term culture-based pedagogical theories (CBPTs) to describe the collection of pedagogical theories that seek to recognize and utilize students' cultural background as a tool for their educational success. These theories include Culturally Congruent Teaching, Culturally Compatible Teaching, Culturally Responsive Teaching, and most notably Culturally Relevant Pedagogy.

Culturally relevant: Culturally relevant refers to the actions inherent in culturally relevant pedagogy, defined as "a theoretical model that not only addresses student achievement but also helps students to accept and affirm their cultural identity while developing critical perspectives that challenge inequities that schools (and other institutions) perpetuate" (Ladson-Billings, 1995; p. 469).

Curriculum: For the purpose of this study, curriculum refers both to the courses taught in an educational institution, and the implicit and explicit venues through which they are taught.

Pedagogical practices: Teacher pedagogical practices refers to the means and methods teachers use in conveying concepts to students in the school or educational setting.

Socio-political science education: science education prioritizes the use of scientific knowledge for the advancement of the societally oppressed

1 BACKGROUND

I was born in Ghana, West Africa. Prior to immigrating to the United States, my two siblings and I were under the care of my aunties, uncles and grandmother—and in the company of many cousins. At the age of eleven, my siblings and I moved to the United States to join my parents who had already immigrated years prior. While the stereotype goes that every well educated child of a West African parent ends up with a career in the sciences, I do not recall my own parents ever expressing a desire for me to pursue the field. My mother was herself a nurse assistant, but her own affiliation with the sciences was not a frequent discussion in our household. I was the creative type, and she supported that wholeheartedly. Being shielded from the cultural (and parental) push in the direction of the sciences, thus, meant that if I was to ultimately love, like, or even appreciate the sciences, I was left at the mercy of the U.S. educational system.

Unfortunately, my first experience with science in the United States was me, fresh off the plane, in sixth grade, copying paragraphs upon paragraphs out of the sixth-grade science textbook. I was a new immigrant, but I had solid educational foundations. I spoke, read, and wrote English well. Academically, I was on grade level, if not slightly above. However, I was not given any assessments to prove my capacity as a student. Simply because I had come from Africa, I was placed in a class that I now realize was of a lower track. All my immediate classmates were Black or Hispanic, although the school itself was quite diverse and there were many Caucasian and Asian students. There were no science experiments in our classroom, and because there was so little scientific discussion of any kind, the only science to which my classmates and I were exposed for the majority of sixth grade entailed this tedious, seemingly unending reproducing of the text book. Whether my sixth-grade science teacher had assumed we

were incapable of anything more than just rewriting our textbook is up for debate. I would like to believe, sadistic as her methods seemed, that there was some logic behind her madness; maybe she had been misled to believe that writing these paragraphs would help us remember the content. Or maybe she would have taught any group of students this way, regardless of their track, because this was the only way in which she knew how to approach science. Or maybe she just did not care for science and saw it unworthy of her efforts. Either way, her pedagogical practices did little for me.

Science in seventh and eighth grade could not have been any better. Although I am sure science class was mandatory and I must have been in a science class every day for those two years, I do not recall any science experiences to speak of—except one. This would be the incident where I picked a complicated science experiment as my class project, and my eighth grade teacher, insinuating that I was not smart enough to execute that one, suggested a much simpler one that she deemed more fitting for my aptitude. I remember realizing, even at that young age, what she was saying. I did not have the socio-political perspective to explain the experience, however, because I had not been exposed to any critical conversations where such things were concerned. Thus, in my innocence, I must have simply filed her insinuation in my psyche as an insult I would forever recall.

High school was definitely not better. Again, I was enrolled in science courses all throughout my four years in high school, but none of my experiences instilled in me an appreciation for the subject to any acceptable level. As a matter of fact, while I do not recall any of the content covered between ninth and eleventh grade, what I clearly do recall is my friend Carmen falling madly in love with a boy named Hector in one of our science classes. Carmen spent a majority of her semester in that science class trying to get noticed by Hector, and passing

anonymous notes, with my assistance, no doubt, in a shameless pursuit to make him aware of her crush. According to social media, Carmen and Hector are now married with 3 wonderful children. Carmen did not end up in the sciences. Neither did Hector.

Then, of course, there was the tedious memorizing of the periodic table that came in twelfth grade. This was followed by an absurd amount of mathematics that involved calculating numbers and elements, for reasons that had clearly gone over my head. It was all gibberish to me. I passed the class only because my cousin, a well-educated son of West African parents, fresh off the plane from Ghana at that time, knew what these calculations were about. He tutored me in one evening. I recall my science teacher being surprised that my grade had gone from an F on my previous quiz to an A on the next one. My cousin was also quite amused when I brought home my quiz. Somehow, because I had gained some constructive understanding from his tutoring, I had unintentionally (and unbeknownst to me) figured out my own way of coming up with the right answers instead of using his process.

Calculating the periodic table was followed by a brief mixing of chemicals in an adjacent science lab, and that was my experience with science in high school. Not surprisingly, I did not seek out the sciences while I was in college. Mandatory electives forced me to take a class on environmental science, and one on basic computer coding. If I did take any other science courses in college, I do not recall them. While I did okay in the science courses that I do recall taking, I had made up my mind that science was for other people, and that fared with me just fine. I double majored in communications and Africana Studies.

Imagine my surprise when many years later, as an elementary educator, I realized how much I liked teaching the subject. While obtaining my master's degree in education, I had the privilege of encountering a professor who was extremely passionate about science in the

elementary educational setting. The projects I had to implement with my students as part of her course encouraged in me a love for scientific topics that I had never known existed. Many of my co-workers at the public school in which I was teaching, however, did not feel the same; they frequently skipped the science time block, and rarely utilized the kits that accompanied the science curriculum. I, on the other hand, would happily collect their unused resources and bring them to my classroom so my students would not have to share everything. Many times, I found myself telling others how I could have easily pursued a career in the sciences had I discovered my fascination with these topics much earlier in life.

In fact, so much did I enjoy the subject that I secured summer gigs teaching 45-minute science sessions at daycare centers to elementary-aged students. On my tours, however, I found that, even though they enjoyed my experiments, many of the students I met (who were mostly of African-descent) had little to no basic foundations in scientific concepts. I reasoned that they had probably had teachers like my coworkers, who had just ignored science altogether; or, like my own experiences in middle and high school, these students had been in science classes every day, but had found the experience and the content unworthy to recall.

Currently, as a second grade teacher at a school with a high immigrant and refugee population, I see, first-hand, my students struggle not only with their surroundings in a new country, but also with the connection of the content standards to their home lives and their prior experiences outside of the school. While a number are from other parts of the world such as Syria and Nepal, a great majority of my students are Black—some African American, and some who have recently immigrated from eastern and central Africa. I often find myself challenged by how to make concepts relevant to my students—how to bring Africa into America; how to allow them to see that their experiences and their people are all a legitimate part of many of the topics

we study in school.

Socio-politically, some of my students have left behind countries, such as the Democratic Republic Congo, where there is turmoil. For them, confronting issues concerning politics, liberation, and oppression has not been optional, because many of their life experiences have been entrenched with the effects of these themes. They are innocent citizens who, for their sake and for the future of their homelands, must be exposed to an education that offers them a critical understanding of their world, and a sense of themselves as intellectually capable agents, worthy of such an education.

Yet, my African immigrant students have now come to a country that does offer greener pastures; but they and their fellow students of African-descent must also confront another form of turmoil. This turmoil is racial in nature, and automatically enrolls them in a war of sorts based on their cultural identity and their skin color. Beginning with an educational system that does not fully understand their needs, the turmoil faced by all children of African-descent in the United States is one that covertly undermines their histories and their capacity as thinkers, achievers, and agents for their communities ((Asante, 1988, 1992; Karenga, 1988;; Ogbu, 2003; Ogbu, 2006; Shujaa,1993; Traore, 2004, 2006;).

My own experiences with science have given me an understanding of what my students are facing, and may continue to face. Because I did not encounter a culturally relevant science education throughout my career as a young student—and because I have not been exposed to teachers in the traditional setting who do teach this way—my students' needs cannot be fully addressed without my own proactive efforts to enrich my pedagogy. As an educator, thus, although I am often consumed with how to better reach my students in all subjects, science and its intersection with the African-descent identity in the elementary setting especially captures me.

This study stemmed from my quest to gain practical knowledge on how to consider the socio-political identities of elementary students of African-descent during science instruction— while instilling in these students a love and an appreciation of the sciences as an everyday part of their lives, and a viable solution to some of the issues their communities face. This study was also born out my concern for other elementary educators, such as the ones I have known, who lack practical examples of effective science pedagogy, and so have settled for a daily neglect of the necessity of a sociopolitical, culturally relevant science education for their own students of African-descent.

The following section provides a more in-depth discussion of the problem addressed by this study. Subsequent sections in this chapter cover the research questions that guided this study, the purpose and significance of this study, and some assumptions and delimitations.

The Problem

As evidenced by comparably lower test scores, higher dropout rates, and higher incarceration rates, many African American students experience difficulties in the mainstream educational setting (Darling-Hammond, 2010; Irvine, 1991; Meiners, 2006; Nasir, 2012; Noguera, 2003). The issue has much to do with the need to recognize African American students' cultural identity as a non-negotiable aspect of their educational success (Gay, 2000; Irvine, 2003; Ladson-Billings, 2005). African-centered schools, detached from the mainstream school system, have taken the initiative to fully immerse African American students in an academic setting that prioritizes their social, cultural, and political identities. For the majority of African American students still enrolled in mainstream schools, culture-based approaches to teaching bring a balanced, critical perspective into the traditional school setting, and serve as a tool that educators can utilize in optimizing their student's success through their cultural identities. These approaches (in

addition to other interest-based approaches such as Connected Learning) have, thus, become the saving grace for a diverse student population in a Eurocentric educational culture (Ito et. al, 2013; Gay, 2000; Irvine, 2003; Ladson-Billings, 2005). However, proponents for cultural relevance in the mainstream setting have protested that the initial intention behind these ideas have largely been lost by many who claim to practice it, especially where its socio-political aspects are concerned (Gay, 2000; Irvine, 2003; Ladson-Billings, 2005). Ladson-Billings (2005) stated:

> Many practitioners, and those who claim to translate research to practice, seem stuck in very limited and superficial notions of culture. Thus, the fluidity and variety within cultural groups has regularly been lost in discussions and implementations of culturally relevant pedagogy. Even when people have demonstrated a more expansive knowledge of culture, few have taken up the socio-political dimensions of the work, instead dulling its critical edge or omitting it altogether. (p. 77)

Indeed, culture-based pedagogical theories (i.e. Culturally Relevant Pedagogy, Culturally Responsive Teaching, Culturally Congruent Teaching) can be found in many mainstream classrooms boiled down to shallow practices such as replacing a character's name with an ethnic one in a text, incorporating misguided curricular content into rap music, or celebrating notable African American figures only during Black History Month (Irvine, 2010; Nobles, 1990). Yet, the perpetuation of culturally-driven educational inequities against students of color is anything but shallow (Ferguson, 2001; Gallagher, Kainz, Vernon-Feagans and White, 2013; Heath, 1983). The Eurocentric values embedded in the American educational system infiltrate not only the curricular content taught in schools, but also the pedagogical means through which this content is communicated (Cortes, 1991; Cortes, 1995; Gay, 2002; Irvine, 1991). This has and continues to create a hidden effect where the educational culture privileges and is fundamentally partial to

students of European orientation—while non-European students must struggle to balance their cultural identities with their academic success (Asante, 1988, 1992; Karenga, 1988; King & Swartz, 2014; Shujaa, 1993; Ogbu, 2003; Ogbu, 2006).

In the specific case of African American students, a history of oppression and disenfranchisement compounds this general issue of negligence experienced by other ethnicities of color. The African American population has had to contend with decades of oppression, overt marginalization and exclusion; yet, inequitable educational structures continue to inhibit the necessary supports needed to combat these practices. Furthermore, the pedagogical methods utilized in many classrooms preserve these inequities. Even when traditional definitions of rigor are met, African American students are still subjected to instruction that largely disregards their cultural sensibilities (e.g. linguistic expressions, communication patterns), their present and historical contributions to the American narrative, and the informal knowledge base they bring into the classroom (Noguera, 2008; Whaley & Noel, 2012). Moreover, while an undisputable purpose of schooling is to produce citizens that contribute to the good and advancement of society, many African American students' are denied the attainment of this purpose because the critical perspective needed to combat their own oppressive social realities is diminished or eliminated from their education. Thus, upon successfully resolving the duality of being African American in a Eurocentric school system, the lack of socio-political relevance leaves many African American students still without the benefit of an empowering education that promotes a lifelong spirit of agency for their communities (Aldridge & James, 2007; Conyers, 2003; Lomotey, 1990; Shujaa, 1993).

To further exacerbate the matter, certain subjects such as those represented in the science, technology, engineering and mathematics fields (STEM) are privileged as free of culture and

bias, and therefore above the discourse on cultural relevance or responsiveness (Aikenhead & Jegede, 1999; Archer, Dewitt & Osborne, 2015; Codrington, 2014; Mutegi, 2011, 2013). This notion of neutrality, in itself a troubling demonstration of how Eurocentric perspectives are accepted as the neutral standard, has fostered a widely held belief that recognizing student cultural identity in crucial STEM fields is unnecessary or difficult (Bryan & Atwater, 2002; Gunning & Mensah, 2011; Lietz, 2001; Wang & Marsh, 2002). Many educators consequently do not regard student culture when teaching such subjects (Bryan & Atwater, 2002; Gunning & Mensah, 2011; Lietz, 2001; Wang & Marsh, 2002). Studies also showed that those who thought they were being mindful of student culture were, upon observation, still teacher-centered, traditional, and in need of more meaningful connections for their minoritized students (King, 1991; King, Shumow, Lietz, 2001; Patchen & Cox-Peterson, 2008).

Thus, there is a general lack of pedagogical practices that authentically merge the prior understandings of marginalized students with the often-isolated subject matters within STEM fields. Many African American students' gradual loss of interest in these subjects goes unconfronted (Aikenhead & Jegede, 1999; Archer, Dewitt & Osborne, 2015). Likewise, due to a lack of relevant, socio-political dialogue within these subjects, many African American students experience feelings of otherness in relating to the conventional images associated with these fields (Archer, Dewitt & Osborne, 2015; Emdin, 2011). Ultimately, African American underachievement and underrepresentation in STEM fields—an issue that is significant and most attributable to cultural incompatibility and pedagogical inadequacy—is, instead, addressed by many in the educational community as a lack of academic aptitude on the part of African American students (Archer, Dewitt & Osborne, 2015; Emdin, 2011).

Providing a Practical Model

Ladson-Billings (2006), stated that being culturally relevant is a matter of educators taking an ethical stance against educational inequities; it is this stance that ultimately informs a genuine approach to culture-based pedagogical theories (henceforth CBPTs) in the classroom. However, it is also the case that because the aim of CBPTs is to combat established classroom traditions, educators who take up this cause must break through and modify hardened pedagogical behaviors enforced by these traditions (Fasching-Varner & Seriki, 2012; Irvine, 2003; Ladson-Billings, 2011; Young, 2010). Coupled with the general "problem of enactment" (Source?) that many educators already face in transferring theories of effective teaching into practice, the effective implementation of CBPTs is not always simple feat (Gardiner & Salmon, 2014; Hammerness et al, 2005). Studies showed, for example, that regardless of teaching experience, content knowledge, or belief in students' competence, many educators expressed legitimate helplessness in recognizing the cultural identity of their African American students in meaningful and beneficial ways (Gay, 2013; Hammond, 2015; Henfield & Washington, 2012; Ladson-Billings, 2011). Other studies reported teachers' hesitancy in addressing socio-political topics in the classroom, and in some cases these teachers incorrectly judged such socio-political topics to be too sophisticated and inappropriate for elementary-aged students (Griffin et al., 2016; Gay, 2013; Young, 2011). Thus, while the causes are many, it seems the "limited and superficial notions of culture" (Ladson-Billings, 2005, p. 77) exhibited in many mainstream classrooms is also a symptom of educators' inability to translate their ethical stance into meaningful instructional practices.

Teachers are in need, therefore, not only of supportive structures that encourage the recognition of students' cultural identity, but also of scholarship that illustrate practical examples

of culturally relevant teaching—especially as it is implemented in environments where student socio-political and cultural identity is a priority.

> We need research that proposes alternate models of pedagogy, coupled with exemplars of successful pedagogues. More importantly, we need to be willing to look for exemplary practice in those classrooms and communities that too many of us are ready to dismiss as incapable of producing excellence. (Ladson-Billings, 1995, p. 483)

In speaking to the need for more scholarship on the practical implementation of CBPTS, this study placed within the Afrocentric framework the issue of teacher misapplication—and in some cases, omission—of culturally relevant teaching. It proposed that for African American students, the educational component of the Afrocentric framework provided this "alternate model of pedagogy"—in that Afrocentric philosophy on education seeks for all students of African-descent the very same ideals that CBPTs seek, and more (see figure 1). Firstly, Afrocentric educational thought posits that African American students cannot claim a true education if the root issues of racism, oppression and cultural hegemony are not addressed (Asante, 2003; King, 2015; King & Swartz, 2014). It also refutes the existence of neutrality in the educational arena and holds that the history and current conditions of people of African-descent necessitate a socio-political dimension in all aspects of their education (Asante, 2003; King, 2015; King & Swartz, 2014). Thirdly, the Afrocentric educational philosophy recognizes and validates other cultural elements that impact academic success but are often overlooked in many classrooms (i.e. linguistics, spirituality, interaction) (Akbar, 2003; Asante, 1988; Modupe, 2003).

The pedagogy of teachers in African-centered schools, therefore, is also reflective of these values (Piert, 2015; Swain, 2011). Whereas CBPTs must battle disconnects between theory

and practice in mainstream schools, teachers in African-centered schools operate in an environment that successfully merges the two (Lee, 1992; Piert, 2015). They not only hold personal epistemologies that are in agreement with the African-centered ideology (therefore accounting for teacher stance and mindset) but are also supported by an administration that is in agreement with this immersion of African cultural elements (Codrington, 2014; Mutegi, 2011, 2013; Lee, 1992; Piert, 2015; Swain, 2011). Because of these structures, the practices of teachers in African-centered schools are highly culturally relevant, and characteristic of what CBPTs advocate and hope all African American students can access in the mainstream setting.
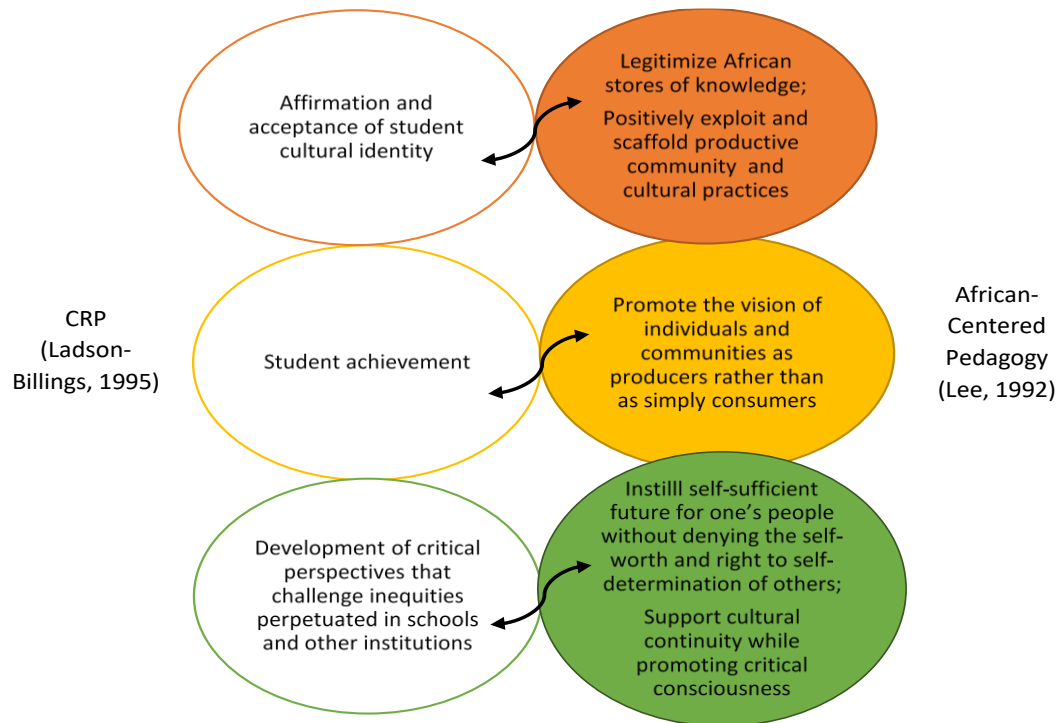
Figure 1. *Parallels between CRP and African-centered educational goals*

This study, thus, positioned the pedagogy of teachers in African-centered schools as a viable example for the practical implementation of culturally relevant teaching practices. It looked at how the culturally relevant, socio-political ideals of the Afrocentric educational philosophy (as reflected in the African-centered curriculum) was translated into instructional practice by one teacher in an African-centered school. With the goal of also making concrete the thought process through which this is achieved, this study inquired into the rationales and motivations behind the teacher's pedagogical choices.

The Focus on Science Instruction

This study further limited its focus to that of science instruction, for several reasons. First, is the need for more evidence against the common belief that culturally relevant, socio-political ideologies do not pertain to STEM subjects. Secondly, science is already a subject in need of more examples, in that educators in the elementary context confess low self-efficacy in science instruction— regardless of their students' cultural background (Appleton & Kindt, 2002; Cho, Kim, & Choi, 2003; Bryan & Atwater, 2002; Gunning & Mensah, 2011; Lietz, 2001;Wang & Marsh, 2002). Thirdly, there is a need for pedagogical solutions that can combat the limited presence of African Americans in the field of science (Codrington, 2014; Mutegi, 2011, 2013). According to the research, only 5% of all bachelor's degrees in the sciences are awarded to Black students, and only 6% of the population in science related careers are Black (National Science Foundation, 2015; President's Council of Advisors on Science and Technology, 2016). A large proportion of the Black community are, therefore, not contributing to the currently innovative atmosphere headed by the sciences, nor challenging hegemonic ideas that monopolize the scientific field. As a result, they are also not enjoying the full benefits of being active participants

in science-based conveniences and dialogue (Loney, 2014; National Science Foundation, 2015; President's Council of Advisors on Science and Technology, 2016).

Pedagogical examples of socio-political science instruction for elementary educators may, therefore, help to challenge power-based scientific reasoning. These examples may also help liberate young students' mindset about the subject and inspire positive change for communities of African-descent (Codrington, 2014; Mutegi, 2011, 2013). Science within the African-centered educational context is not exempt from culturally relevant instruction, or from socio-political conversations that intersect with the science discipline. Focusing on science instruction in this context contributed to the scholarship on examples of this kind.

Research Questions

The following questions guided this study:

1. How do the ideals in an African-centered science curriculum manifest in the pedagogical practices of a science teacher in an African-centered school?

2. How does a teacher in an African-centered school address the socio-political aspects of the African American identity in her pedagogical practices during science instruction?

3. What is the teacher's perspective on her pedagogical choices in transferring the African-centered curriculum into practice during science instruction?

Purpose of Study

The purpose of this study was to examine the practices of an elementary education science teacher in an African-centered school, and how she translated the African-centered curriculum into effective instructional methods. Through the case study methodology this study looked at how this science teacher recognized her African American students' cultural identity within

the science discipline, how she addressed the socio-political dimensions in the science subject, and the thought process behind her pedagogical choices.

Significance of Study

There is need for more research on independent Black institutions that "synthesize their aggregate positive work for Black students in a way that provides a model for all institutions to consider in their approach to educating this population" (Arroyo and Gasman, 2014, p. 58) — especially in the elementary educational context. This study can contribute to empirical work that document efforts that consider the cultural and socio-political identity of African American students, especially in disciplines that are widely believed to be culturally neutral.

This study also recognizes that, although the topic has received fleeting attention in other studies, there is an opening in present Afrocentric educational research, as well as general educational research, for studies that specifically document the manifestation of the African-centered curriculum in teacher pedagogical practices. This study, therefore, aimed to extract from all the important connections that constitute the African-centered educational initiative, the direct connection between curriculum and teacher pedagogy. The goal was not to connect the Afrocentric idea to general teacher practices, as that can be found in previous theoretical pieces (Lee, 1992). The goal of this study was to directly connect the African-centered educational philosophy in use at one school with the pedagogical practices observed during the instruction of one subject (in this case, science) at this school. In doing so, the hope was that teachers outside of African-centered contexts can utilize the findings to inform their own efforts at linking theory and practice—and in the process ensure a more holistic education for African American students.

Assumptions and Delimitations

This study assumed that, because African-centered schools have the Afrocentric educational approach as their foundation, there are commonalities in how teachers in African-centered educational contexts translate the African-centered curriculum into practice. This study also assumed that while all African-centered schools may not use the same curriculum, they collectively emphasize the Afrocentric ideals of consciousness, freedom, harmonious inclusiveness of all cultures through centrism, unity among all persons of African-descent, and a political stance in the deconstruction of Eurocentric imposition. This study further assumed that, even with curricular differences, the merging of theory and practice documented in the findings could provide all teachers of African American students with implications for a more effective, holistic approach to science instruction—no matter the context. This study, however, did not take for granted the vital role of environment and "good teaching" that can differentiate all levels of effectiveness in spite of curriculum in use (Ladson-Billings, 1995). It assumed, though, the best of all teachers who have been properly informed through practical and effective means.

This study was limited in its inclusion of only one teacher, and its utilization of only one African-centered school. As much as the case examined may have represented other African-centered classrooms across the country, the personality of the teacher participant, the specific content of the curriculum, the school-wide environment, and even the geographical location of the school may have influenced the outcomes and findings. Also, this study utilized interviews and observations as the methods for data collection. Although these do not necessarily constitute a limitation, there are general validity matters associated with all qualitative approaches to research. The address of these matters can be found under methodology, in chapter three.

Overview of Study

This chapter provided a background to this study and a statement on the problem. Chapter two delves into an extensive literature review of the major topics that influence the problem addressed in this study. Chapter three provides the theoretical perspective of this study, as well as the methods for data collection and data analysis. The findings of this study can be found in chapter four. Chapter five contains a discussion of this study's findings, its implications for elementary science educators, its contributions to existing educational research, and recommendations for future research. An overall conclusion of the study's findings and its implications can be found at the end of chapter five.

2 REVIEW OF THE LITERATURE

The purpose of this study was to examine the practices of an elementary education science teacher in an African-centered school, and how she translated the African-centered curriculum into effective instructional methods during science instruction. This review of literature begins with a brief discussion on the Eurocentric foundations of the American school system. It then presents findings on the pervasiveness of culture in the classroom setting, and its impact on the education of African American students. It further reviews the literature on culture-based pedagogical theories (i.e. Culturally Relevant Pedagogy, Culturally Responsive Pedagogy, etc.), the themes that have been found to unite successful implementations of these theories, and the problematic break between theory and practice that plague many teachers in the traditional educational setting. This review of literature then presents existing scholarship that advocates the Afrocentric educational philosophy as a viable example for the culturally relevant teaching of African American students. Following that, is the research findings on culturally relevant teaching in science, as well as the existing literature on socio-politically inclined science education for African American students. The literature review then proceeds to provide information on African-centered schools, including the reservations some have about these institutions, and the scholarly response to these reservations. Concluding this chapter is a review of the relationship between curriculum and teacher pedagogy, and the Afrocentric perspective on the matter.

Traditional American Curriculum

In an article critiquing the Afrocentric perspective on education, Ravitch (cited in Asante, 1991) declared that centrism encourages insidiousness. She insinuated that there is a common American culture that can objectively promote unity, if all would just obediently acclimate to it. While this would have been ideal, the unfortunate reality is that the American curriculum was

neither built on inclusive foundations, nor meant to consider an African racial group that was formerly enslaved, deprived an official education, and believed to be incapable of academic success (Cornelius, 1986; Goodell, 1968; Hope Franklin, 1976; Sizemore, 2008; Yanuch, 1995). In fact, it was not meant to consider anyone of non-European descent—nor did it perceive this as a problem. Foundational theories, such as the perennialist and essentialist perspective, for example, collectively saw little purpose in educational models that consider the social aspect of the individual, and viewed student-centeredness in education as wasteful (Hutchins, 1954; Adler, 1982; Tanner & Tanner 1990). The perennialist view of education, specifically, regarded knowledge as "external and absolute" (Tanner and Tanner, 1990, p. 330). It prescribed that the curriculum not only be the same for everyone, but also that this single curriculum be "properly centered on the classical literary works of the Western world, and on classical language—the traditional liberal education" (Tanner and Tanner, 1990, p. 330). It, therefore, proposed a hegemonic view that not only designated a single student identity for all, but also assigned the Western culture as the only one worthy of reverence and study.

      Impact on African American students. This supposedly objective approach to education, thus, disregarded the ethnic and cultural identity of non-European students, as well as the implications of students' identity in the classroom setting (Boykin & Bailey, 2000; Gay, 2002; Tyler, Boykin & Walton, 2006). For students of African-descent, this disregard continues to mean a lack of topics in the educational arena that acknowledges their existence. While most European Americans enjoy the benefit of learning about their histories in schools, truthful accounts of African American history are barely addressed, or manipulated to fit the European narrative (Hilliard, 2005; King & Swartz, 2014). Hilliard (2005), for example, found six deficiencies in the historical coverage of African Americans in the public school curriculum. They included a lack

of: African history prior to slavery; continuity in the history of African people as a whole; history about Africans and the African Diaspora; cultural unity among all of African-descent; history on the resistance of African people to slavery, colonization, segregation and apartheid. Overall, there was a failure to explain the reasons behind the systemic oppression of African peoples.

Additionally, the disregard for non-European identities means for African American students, the need to balance their own cultural tendencies with the Eurocentric practices entrenched in traditional educational settings (Boykin, Tyler, & Miller, 2005; Fordham & Ogbu, 1986; Ogbu, 1982, 1990; Shujaa, 1993; Smitherman, 1994). In the area of linguistics and communication, for example, research showed that most African American students belong to communities with interactive communication styles (Gay, 2002; Tyler, Boykin, Boelter, & Dillihunt, 2005; Tyler, Boykin, Miller, & Hurley, 2006). This means verbal and written language that is "highly contextual…passionately and personally involved … indirect … embedding talk with feelings of intensity, advocacy, evaluation, and aesthetics…weaving in many threads of issues into a single story…conversational" (Gay, 2002, p. 112). In the traditional classroom setting, however, students from these communities are expected to exhibit a topic-centered Eurocentric style that is "direct, precise, deductive, and linear in communication" and "objective, dispassionate and explicit" (Gay, 2002, p. 112). Many students are therefore denied their natural mode of expression.

Likewise, Boykin (2000) identified communalism, movement expressiveness, verve, and orality as four areas that characterize African American culture, but are often disvalued in the traditional educational setting. He found that the communal nature of many ethnicities of color predisposes African American students to a preference for interacting with other students in the educational setting. A report that surveyed a total of 119 African American students between second and fifth grade found that 70% of these students preferred:

1. Communal learning contexts that promote such activities as, sharing of knowledge and materials, as well as working and studying together in groups so that all members can achieve;

2. School contexts that allow for music and movement opportunity and expressiveness; and

3. School contexts that employ a variety of vervistic, high-energy pedagogical and learning strategies. (Boykin & Bailey, 2000, p. 26)

In the same way, using an instrument that measured the verve levels of students and their standardized test results, Carter, Hawkins and Natesan (2008) found that African American students exhibited higher verve levels than their European counterparts. Additionally, the study found that students who had higher verve levels scored lower on mathematics and reading tests, implicating the consequences of instructional incompatibilities and the need for other strategies in the classroom that cater to these students.

In spite of these findings, the literature revealed that traditional classrooms are often individualistic and controlled. Many African American students in the mainstream educational setting are therefore left in the predicament of being, at best, misunderstood, and at worse labeled as misbehaving, talkative, or disrespectful—all while they cope with the discontinuity between their home culture and their schools' expectations (Boggs, 1985; Ferguson, 2001; Gay, 2002; Heath, 1983). Gay (2002) pointed out that many African American students are "in effect, intellectually silenced. Because they are denied use of their natural ways of talking, their thinking, intellectual engagement, and academic efforts are diminished as well" (p. 111). Consequently, the literature revealed that African American students are more likely to be suspended, more likely to be referred and enrolled for special education services, more likely to underachieve academically, and

more likely to drop out of school (Aud, Fox, & KewalRamani, 2010; Spilt, Hughes, Wu, and Kwok, 2012).

Teacher Pedagogical Practices

The incompatibility between students' culture and that of the classroom does not only implicate curricular content and delivery, but also the teacher pedagogical practices that enhance or mitigate their effects. The importance of teachers' role as facilitators or navigators of classroom experiences is second only to a systemic change in the institution of education itself (Freire, 2003; Jimerson and Haddock, 2015, Pianta et al., 2003). Ferguson's (1991) study of achievement gaps across demographics, for example, found that while socio-economic status could not be discounted, the quality of the classroom teacher accounted for all other achievement differences amongst students. Yet, as noted by Asante (1991), "the fact that an African American or an Hispanic person, in order to master the white cultural information, has had to experience the death of his or her own culture does not register with most teachers" (Asante, 1991, p. 29). As a result, many uninformed teachers do not regard culture and use inappropriate measures to judge their students. For example, after researching the compatibility between mainstream schooling and that of the culture of three different groups, a study by Heath (1983) revealed that, due to African American children's way of talking and expressing themselves, teachers who expected differently of them rated their behavior as troublesome.

Unfortunately, the literature also revealed that teacher reinforced cultural incompatibilities create contentions between teachers and students that transcend mere relational differences. Spilt, Hughes, Wu, and Kwok's (2012) study on students identified to be at-risk found student conflict with teachers in elementary school to be a predictor of their underachievement in later years. They also found that the number of years students had conflict with teachers correlated

with the level of underachievement students later experienced. Spilt and Hughes (2015) also found that possessing an African American identity was often the initial predictor of teacher-student conflict. They examined the impact of six predictors on student-teacher conflict (African American ethnicity, socio-economic status, IQ, inhibitory control, aggression and prosocial behavior) in the elementary school setting and found that while SES and IQ were not predictors of student-teacher conflict, students' African American ethnicity was. Likewise, Gallagher, Kainz, Vernon-Feagans and White (2013) found that although boys in general were likely to have a contentious relationship with teachers, behavior of students usually mitigated the gender factor. Yet, they found, contentions existed between African American students and their teachers irrespective of their gender or their behavior (Gallagher, Kainz, Vernon-Feagans & White, 2013).

      The opposite was however also found to be true, where teacher recognition of African American culture in the classroom was shown to increase academic performance as well as student self-perception and self-efficacy (Boykin & Bailey, 2000; Ladson-Billings, 1995). Boykin and Bailey (2000) discovered that academic problem solving, comprehension, and activities that required cognitive processing (such as inferencing and encoding) were better completed by students when classrooms responded to the characteristics of African American culture by including music, allowing communal work, and varying tasks regardless of task type. Rouland, Matthews, Byrd, Meyer and Rowley (2014) also examined the saliency and effects of mainstream cultural styles and Afrocentric cultural styles (Afrocultural) in classrooms that serve African American students, and found that classrooms that incorporated Afrocentric instructional styles such as expression, movement and communalism reported less behavioral problems and better social skills.

Culture-Based Pedagogical Theories

Efforts that advocate culturally relevant teacher practices recognize the monumental role of teacher pedagogy in addressing the problematic treatment of non-European ethnic identities in schools. While various terms have been used to characterize these efforts, their ultimate goal has collectively been to validate students' unique and diverse backgrounds, and to use these validations as a foundation educational success. Gay (2010) used the term Culturally Responsive Pedagogy, and defined it as "using the cultural knowledge, prior experiences, frames of reference, and performance styles of ethnically diverse students to make learning encounters more relevant to and effective for them" (p. 31). Singer (1988) as well as several others (Erickson, 1979; Erickson & Mohatt, 1982; Scollon & Scollon, 1981; Irvine, 2003), also employed the term Culturally Congruent, defined as when educators identify "cultural differences that are obstacles to learning in standardized classrooms, and then use this information to change classroom instruction and management to fit with students' cultural standards and expectations" (Singer, 1988, p. 1).

Culturally Relevant Pedagogy (CRP), however, has been the most utilized of these terms, and the most recognizable among educators (Brown-Jeffy & Cooper, 2011; Ladson-Billings, 2005; Young, 2010). Ladson-Billings (1995), although acknowledging other forms and terms that have been previously or concurrently utilized by others, coined Culturally Relevant Pedagogy, defining it as a form of pedagogy that "not only addresses student achievement but also helps students to accept and affirm their cultural identity while developing critical perspectives that challenge inequities that schools (and other institutions) perpetuate" (p. 469).

Ladson-Billings (1995) found, through a study of eight community-nominated teachers at a majority African American School, that several characteristics are common to successful teach-

ers of African American students, and that it is these characteristics that make their teaching relevant and effective for their students. She found that the pedagogy of the teachers in her study were impacted by the following: their conceptions of themselves and others, the manner in which they structured their social relations, and their conceptions of knowledge. She also outlined the beliefs of the teachers and concluded that they held in common philosophies regarding the following: the academic capability of their students, the growth of their own pedagogy, their position as part of their students' communities, their view of teaching as a service to the community, and the necessity of using their skills to mine their students' knowledge. Ladson-Billings also recognized other shared characteristics that included the teachers' treatment of knowledge not as static truths, but as constructed perspectives often in need of critical examination. Successful teachers of African American students, she also found, encourage classroom practices that were compatible with their African American students' culture; for example, unlike the competitive nature of traditional classrooms, they utilized collaborative learning strategies that allowed students to take responsibility for one another as participants of the classroom community.

Other research on successful teachers of African American students also revealed similar findings. Irvine's (1999) work with teachers of African American students in Atlanta public schools, for example, found that, in addition to their general duties of facilitating and helping students master content standards, successful teachers believed their practices also required attitudes that fall in the following categories: "other mothering," believing, demanding the best, responding to one's calling, and disciplining (p. 249). Likewise, Shockley's (2011) case study of an Afrocentric teacher in a traditional public school found that the teacher used energy, knowledgeability and relationship-building with students and their parents to instill historical consciousness and collective agency in his students. Shockley also found that the teacher simply cared about

and loved Black people, and this care and love manifested in his integration of Black history and culture into all subjects and all aspects of his interaction with students—even though he was the only one at the school with that passion.

Practical examples of Culturally Relevant Pedagogy could also be found in the literature (Bell & Clark, 1998; Hefflin, 2002; Henry, 1996; Hollie, 2001; Howard, 2001; Ladson-Billings, 1995). Ladson-Billings' (1995) study, for example, showed one teacher instilling pride in students and connectedness between the school and community, by having the students propose alternate ways to utilize an abandoned lot in the community. Another example showed the building of cultural competence through the incorporation of books and artifacts more relatable and affirming of students' home lives and prior knowledge (Bell & Clark, 1998; Hefflin, 2002). Some studies also evidenced teachers' acknowledgement of students' linguistic competencies (Henry, 1996; Hollie, 2001; Howard, 2001).

In all, while the pedagogies discussed in much of the research were reasonably specific and unique to the cases studied, collective consensus pointed to several indispensable traits in the effective implementation of CBPTs for African American students. These included teachers' care for African American students (Irvine, 2010; Ladson-Billings, 1995), teachers' high academic expectations of students, and teachers' proactive efforts in facilitating connections between classroom content and real conditions in students' communities (Irvine, 2010; Ladson-Billings, 2006). Several other empirical—and theoretical—sources also placed emphasis on the importance of teachers' own revelation of the inequitable structures that govern the lives and communities of their students (Delpit, 1995; Irvine 2010; Ladson-Billings, 2006).

The Need for a Models of Culturally Relevant Teaching

The literature also showed that efforts that promote cultural recognition in the classroom share a burden of being distorted and misunderstood by educators. For the amount of teachers successfully utilizing culturally relevant pedagogy to educate their African American students, many, many more are daily misinterpreting the nature and application of these theories, and lack an accurate conception of how it is supposed to manifest in the classroom setting. Young (2011) chronicled this phenomenon in a study of teachers' utilization of CRP in the classroom, and listed Ladson-Billings' definition of the CRP tenets alongside her teacher participants' definition of these same tenets. She found that while on the surface the two seemed to overlap, they were not truly aligned. For example, Ladson-Billings () was more concerned about teachers' perceptions of their students and their ability to create an atmosphere in which students exhibit the tenets of cultural competence, a community-oriented mindset, and a critical perspective of knowledge. Young's () teacher participants, however, were more focused on the students themselves exhibiting these traits, instead of the teachers' role in facilitating the students' growth. Reflecting on this same phenomenon, Fasching-Varner & Seriki (2012) stated that what is

> …perhaps more alarming is the staunch and often fierce desire of the educators to learn about how to deal with "others" as opposed to thinking through how their identities as educators might interact with the identities of students in productive and complex ways. (Fasching-Varner & Seriki, 2012, p. 3).

The literature, thus, evidenced a break between theory and practice that is often due to teachers' limited understanding of "culture" in the classroom. Irvine (2010) shared the story of a teacher who attempted CRP by utilizing a rap tape in her math lesson; this teacher rather wound up having to manage her students' focus, not the tape's math content, but the substandard quality

of the music and its lyrics. Hammond (2015) also gave the example of a science teacher being perturbed about the prospect of having to rap about the periodic table because somehow she had assumed that it was the only way to teach science in a culturally responsive way. Ladson-Billings (2006) noted the effects of these misunderstandings:

> A semester or staff development session typically ends with teachers unsure of what they can or should do and eventually defaulting to regular routines and practices. Nothing changes in the classroom and poor students of color are no closer to experiencing the kind of education to which they are entitled (p. 163).

Furthermore, a recent study by Griffin, Watson and Liggett (2016) found that even supervisors of pre-service teachers whose position it is to assist others, do not always have a full understanding of how CRP should function in the classroom. In analyzing the responses of twenty-eight teacher preparation program supervisors, Griffin et al (2016) concluded that although the program was dedicated to equity and social justice, the supervisors were "largely able to state pieces of the definition, but often they struggled to express what CRP looked like in actual classrooms, and/or actions they reported taking lacked cultural responsiveness" (p. 5). Additionally, the supervisors confessed their inadequacies in, for example, knowing which classroom difficulties were due to culture, which were not, and how to go about addressing these difficulties.

Most misunderstood and especially contentious for teachers to broach was the socio-political element. In their study of supervisors, for example, Griffin et al. (2016) found that the teacher educators often disregarded the critical aspect of race, and instead took a color-blind approach that eliminated challenging race-related conversations with their supervisee teachers. The literature also revealed that teachers' difficulty in addressing the socio-political element was often due to their misunderstanding of the very purpose of the socio-political element in CRP.

Young (2011) found that some teachers are under the impression that discussing socio-political issues in the classroom would mean an imposition of politically sensitive ideas unto others; these teachers also lacked the insight that their role is to "invite students to question, challenge, and critique structural inequalities that exist in society, not to replace one hegemonic ideology with another" (Young, 2011, p. 255). Gay (2013) observed the same and noted how most teachers consequently

> concentrate on only "safe" topics about cultural diversity such as cross-group similarities and intergroup harmony, and ethnic customs, cuisines, costumes, and celebrations while neglecting more troubling issues like inequities, injustices, oppressions, and major contributions of ethnic groups to societal and human life" (57).

The literature, however, revealed that many teachers were aware of their inadequacies as culturally relevant or culturally responsive educators, and were even more cognizant of the need for them to be exposed to examples that illustrate effective applications of CBPTs in the classroom—especially where the socio-political element is concerned. Henfield and Washington (2012), for example, found in their study of white teachers of African American students, that some of these teachers were privy to the cultural discontinuities experienced by their African American students; yet, although they were open to being more culturally relevant, many confessed to not knowing how, and often requested more techniques to add to their repertoire of culturally relevant classroom practices. Likewise, Ladson-Billings (2006) mentioned her encounters with "prospective and in-service teachers who quickly reject teaching for social justice by insisting that there are no practical exemplars that make such teaching possible" (p. 163). Gay (2013)

also cited teachers who put off being culturally responsive in the classroom by "claiming incompetence (i.e., 'I would do if I knew how')" and asking for a "certainty of success before even attempting any culturally responsive teaching" (p. 56).

The Afrocentric/African-Centered Approach as a Viable Model

The literature, thus, evidenced a need for examples of culturally relevant pedagogy that especially espouse its socio-political aspect (Gay, 2015; Henfield & Washington, 2012; Ladson-Billings, 2005; Fasching-Varner & Seriki, 2012; Young, 2010). Additionally, in the specific case of African American students, the literature called for more opportunities where educators can learn about (and gain a sense of empowerment in addressing) the socio-political narratives relative to the African-descent identity. As noted by King (2015), many educators take social injustices for granted and are uncritical due to their lack of exposure to "strengths-based Black studies (or Ethnic studies) analyses" (p. 5). Many educators, she stated, consequently suffer from "dysconscious racism" (King, 2015, p.113), where they are unaware of socio-political issues concerning their students because of their own miseducation and the distorted ideas concerning race and inequity they have been offered throughout their educational careers. Hilliard (1995) likewise problematized the lack of a cultural knowledge base in mainstream educators that can give them a true understanding of who African American students are "in time (chronology) and in space (geography), in terms of the thematics of the evolution of their culture" (p. 23).

There surfaced, hence, a necessity not only for examples that offer practical implementation of CBPTs, but examples such as the African-centered approach that also expose teachers to educative measures that satisfy the intellectual, spiritual, cultural, and social needs of African American students (Shockley, 2011; King, 2015). Such examples encourage the sense of empowerment within educators that is necessary in truly educating their African American students,

even within the limitations of the mainstream educational environment (Asante, 1992; King, 2015; Shockley, 2011). Furthermore, as stated by King and Swartz (2014), an introduction to—and the utilization of—Afrocentric educational standards can help educators of African American students to "identify more with the families of their students and the communities their students will be serving than with the hierarchy above them" (p. 93)—thereby "interrupting" a system that miseducates and alienates students of African-descent. Asante (1992) also advocated the utilization of the Afrocentric approach as a example, noting that although segregation was built on racism and had intentions of injustice and inequity, self-contained schools for African Americans in that era had the benefit of centering African American students' identity and the community within educational goals. The Afrocentric educational philosophy calls attention to the benefits that existed in the all-encompassing educational setup that resulted from forced segregation. Thus, Asante stated, "by combining the best elements of the centering process reminiscent of the segregation era with the best of today's more sophisticated techniques and equipment, we might find a new synthesis in our ability to teach children" (Asante, 1992, p. 31).

Yet, the literature noted that inasmuch as the African-centered approach is "one of the only truly sensible approaches to educating Black children" (Shockley, 2011, p. 1043), its ambition to center the uniqueness of the African American struggle makes teachers resist in many ways— systemically, politically, and personally (i.e. teachers' own personal anxieties). King and Swartz (2014) stated:

> Many teachers do not realize and even reject the possibilities of Afrocentric education. This rejection has been fueled by ideological assimilationist propaganda that disparages African American group belonging and identification with Africa masquerading as scholarly discourse" (p. 158)

Recognizing the same, Shockley (2011) noted that teachers and others in the educational arena avoid the Afrocentric approach because of its unbridled ambition to tackle all aspects of the African-descent identity in America, including the truths most in the mainstream would rather avoid. He stated:

> Afrocentric education is marginalized in mainstream discussions because some people are uncomfortable with the notion of dealing with Black people's realities for prolonged periods of time. In other words, reminders of the atrocities that African American have faced (such as slavery, lynching, Black codes, etc.) make many educators (of all races) very uncomfortable (p. 1043).

Discomfort, and/or political or systemic, resistance, however, does not eliminate the need for the Afrocentric approach to be explored. Neither does it eliminate the need for all teachers to be exposed to how this approach manifests practically in the classroom. As posited by the Afrocentric perspective, consciousness is an important ingredient in the gaining of empowerment and agency in students and teachers (Asante, 2003; Lee, 1992; Modupe, 2003). In exploring and bringing to light the culturally relevant practices of a teacher in an African-centered school, this study broadened the scholarship on how the Afrocentric educational philosophy can contribute solutions to the mainstream issue of effectively educating African American students. Additionally, it brought to light the progressive endeavors that are taking place in African-centered schools, although many easily dismiss or take these schools for granted.

Science Education and Cultural Relevance

The position of science (and other STEM subjects) as often isolated and removed from other subjects has meant that, most students, regardless of cultural or ethnic background, already experience what Aikenhead (1996) called a cultural border crossing. This is where most students

must negotiate the differences between their lifeworld culture and that of western science in schools; it is also where students must learn how to take the scientific knowledge they receive from their classroom instruction and apply it to their daily lives. The literature revealed that for Africans American students and other students who identify with non-European cultural norms, this border crossing poses an even more difficult task due to all the other cultural and ethnic in-compatibilities they already face (Emdin, 2011; Aikenhead, 1996; Aikenhead & Jegede, 1999, Archer, Dewitt & Osborne, 2015). Furthermore, for many students in this category, the usual lack of meaningful, empowering, socio-political connections in science classrooms makes the effort of border crossing unworthy of its rewards (Archer, Dewitt & Osborne, 2015; Emdin, 2011). Consequently, these students are often faced with the choices of assimilating into a sys-tem with which they cannot identify, resisting assimilation, or gaming the system—none of which result in students' true identification with the sciences or their pursuit of it as a future ca-reer (Aikenhead, 1996; Aikenhead & Jegede, 1999).

The literature showed, furthermore, a general apprehension to teaching science among early childhood teachers (Appleton & Kindt, 2002; Cho, Kim, & Choi, 2003). This was espe-cially the case where teaching science from a socio-political perspective was concerned (Bryan & Atwater, 2002; Gunning & Mensah, 2011; Lietz, 2001;Wang & Marsh, 2002). Wang and Marsh (2002), for example, found that science educators in both the elementary and secondary settings did not believe it was appropriate to include the history of science for social justice and empowerment purposes. While some sources attributed elementary educators' discomfort to a lack of confidence about their own pedagogical and content knowledge in the sciences, the litera-ture also evidenced that, in many cases, teachers simply lacked references for effective, cultur-ally informed presentations of science (Bryan & Atwater, 2002; Gunning & Mensah, 2011;

Lietz, 2001). In instances where teachers believed in the value of connecting to student identity and interests, and where they judged their own practices to reflect a democratic, empowering, hands-on approach, studies found that most of their practices were still traditional and teacher-directed (King, 1991; King, Shumow, Lietz, 2001; Patchen & Cox-Peterson, 2008). Additionally, findings from several studies concluded that certain presentations of science in the early education setting not only neglect students' identity and prior knowledge, but also deter students from later pursuing more in-depth explorations of scientific concept (Archer, Dewitt & Osborne, 2015; Emdin, 2011).

The literature further evidenced that in addition to the general need for more meaningful early childhood educational experience in science, there is also a need for ongoing dialogue about how teacher attitudes and pedagogical practices especially affect children of color (Pringle et al., 2012; West-Olatunji, 2008; West-Olatunji et al. 2010;) Pringle et al.'s (2012) longitudinal study of science and mathematics teachers of African American students in an elementary setting found that "more so, it was evident that the science experiences they provided lacked rigor and opportunities for the development of critical thinking skills or a level of comfort and connected-ness to science" (pg. 224). Additionally, "teachers also lacked awareness of their roles as advo-cates for girls' success in mathematics and science" (pg. 22). The results of another study by West-Olatunji et al. (2008) also suggested that some students do not feel that their mathematics and science teachers incorporated their lived experiences into course instruction. Consistent with current literature, the students in the study spoke favorably about teachers who did infuse their lived experiences into course instruction, and labeled other teachers who did not do so as "bor-ing" (West-Olatunji et al., 2008, p. 225).

More specifically, thus, the literature supported a need for science instruction for children of color that recognizes their communities and integrates scientific concepts with students' lives outside of the school structure (Lee, 1998, 2003; West-Olatunji et al., 2008; Calabrese Barton & Tan, 2009; Jhumki Basu & Calabrese Barton, 2007). In that, this form of science teaching increases interest in science learning and science achievement for students of color. Simpson and Parsons' study of an informal science program for African American students, for example, looked at the perspectives of students, their parents, and their teachers. Through interviews and researcher observation, the study found that what the parents expressed to be the ideal characteristics of an effective science program aligned with the nine elements mentioned in Boykin's Black Cultural Ethos (BCE) (Simpson & Parsons, 2008). Also, Simpson and Parsons found that the students' satisfaction and response to the program, and the ultimate success of the program, had much to do with how well the program was aligned with BCE elements. Likewise, Parsons (2008) found that when science programs aligned with BCE, the science achievement level for African American students increased.

Several studies that utilized the Funds of Knowledge approach to teaching (Moll, Amanti, Neff & Gonzalez, 1992) emphasized the main principle of utilizing the untapped knowledge students already possess from traditional cultural understandings in their homes. Studies of science education that employed the Funds of Knowledge concept recommended engaging students by utilizing their culture and language in the classroom to enhance students' understanding of formalized scientific knowledge and to minimize sentiments of alterity in students created by language barriers (Calabrese Barton & Tan, 2009; Jhumki Basu & Calabrese Barton, 2007; Lee, 1998, 2003).

In spite of the dismal results on teachers' ability to implement culturally relevant science education that is beneficial to students, the literature revealed several studies that provided practical illustrations of socio-culturally inclined pedagogical practices during science instruction. Calabrese Barton and Tan's (2010) case study of a science teacher in a majority African American and Hispanic urban public school, for example, revealed that the teacher involved the community by using grant money to take overnight, weekend science themed trips with students and their parents. The teacher emphasized science in informal spaces, out in the community outside of the school, so students could identify with science without the disruption of testing and textbook content. Additionally, the teacher used the art of storytelling, and invited students to be "real" by creating skits and dramas that illustrated connections with their out-of-school knowledge. Other practices included invoking scientific understandings in students by using public figures with which all student were familiar, and creating an afterschool science club that parents were welcomed to join.

Johnson (2011) also studied the trajectory of two middle school teachers' efforts at utilizing culturally relevant practices for their predominantly Hispanic students. She tracked the changes in the teachers' perspectives of their students as they progressed through a Transformative Professional Development program set up to explicitly aid teachers in exhibiting the tenets espoused by CRP (i.e. their conceptions of their role as educators, their conceptions of their students and their students' knowledge base, their relationships with their students, their approach to pedagogy as an art, their broaching of socio-political issues that concerned the students' communities, et cetera). The study found that the teachers progressed significantly in their practical presentations of these CRP tenets in the course of this three-year longitudinal study. One teacher, for example, moved from a teacher-centered approach to having students working consistently in

cooperative groups of four. Another example included one teacher's conceptions of knowledge shifting to the use of student reflective journals as a source of performance assessment as opposed to the traditional practice of only using tests for this purpose.

These studies and others of their nature gave much insight into the importance and effectiveness of explicit support geared towards the implementation of culturally relevant teaching in science classrooms. They also provided much needed examples of practical implementations of culturally informed pedagogy in science classrooms. Most, however, were based in the middle and secondary context. One study that could be found based in the elementary setting examined two teachers' use of constructivist concepts in implementing culturally relevant pedagogy in science (Patchen & Cox-Peterson, 2008). The findings revealed that although the teachers in the study adhered to some aspects of culturally relevant pedagogy—such as relating scientific concepts to students' every day experiences—their instruction was still missing aspects of cultural relevance that would have been beneficial to their majority native Spanish speaking students. The socio-political dimension, for example, was absent, as no conversations related to power-based dynamics were ever observed. Thus, the teachers were traditional in their practices more often than not, even with the effort of being more culturally relevant. Patchen and Cox-Peterson (2008) stated:

> Given this tendency to perpetuate traditional patterns (like the pervasiveness
> of direct instruction), it seems the culture of teaching science, and even more trenchantly
> perhaps, the culture of teaching teachers to teach science, must change before cultural
> relevance can be enacted in classrooms (p. 1009).

Additionally, while much of the literature on culturally relevant science education concentrated on marginalized student populations, they were not often specifically focused on African American students. Also, unlike this current study, the studies found were not based in the African-centered educational setting where interpretations of scientific concepts are highly considerate of the cultural and socio-political identity of African American students.

Afrocentric / African-Centered Approach to Science Education

Emphasizing the ideals of centrism, critical analysis and agency, the African-centered approach to science education further challenges those who advocate culturally relevant presentations of science to also advocate the use of scientific knowledge for the advancement of the societally oppressed (Codrington, 2014; Mutegi, 2011, 2013). It argues that while science is for all students and all cultures, its reputation as neutral and exempt from cultural bias or socio-political influences is especially inaccurate where African American students are concerned. For one, culturally-biased definitions of science—and culturally-biased representations of those who can successfully do science—discount daily the informal scientific knowledge African-descent students bring to the classroom setting, marginalizing them and their communities (Archer, Dewitt & Osborne; Emdin, 2011). Secondly, science was used, historically, to denigrate the physical, emotional and mental capacity of people of African-descent, for socio-political purposes—and many of these ridiculous findings still aid in the perpetuation of racist notions against the Black race today (Gould, 1981; Kidd, 1904; Jensen, 1999; Madison, 1916).

Codrington (2014) contended, therefore, that while it is important that public education has come to the realization that science is for all and for the advancement of society (hence the popular public school initiative), this ideal still does not apply to groups such as African Americans if science is not used to advance them in liberatory ways. Codrington (2014) stated:

If we truly are aligned with this goal, science education for oppressed student

groups would enable them to act on structures of domination (racism and oppression) that

threaten the survival and empowerment of their families, communities, and future genera-

tions, which is the most pressing personal and social issue they face. Further, teaching

outcomes would include the ability for educators to interrogate the fallacy of a ''stand-

ard'' science education in their classrooms and neutrality of core standards, to highlight

the contributions of indigenous peoples to the field of science, and to teach effective

strategies for applying science to the liberation struggle. (p. 1021).

The literature, however, revealed this approach to science education to be uncommon.

Likewise, while commentary on its necessity could be found (Calabrese Barton, 1997; Dos San-

tos, 2009; Lemke, 2001; Mutegi, 2011, 2013; Seiler & Gonsalves, 2010) empirical documenta-

tion on this kind of science instruction—also labeled "liberatory" science in the literature—were

few. Reasons cited included the lack of fidelity to the CRP tenet of pushing students to develop a

critical consciousness that challenges the status quo. While this tenet would have done much to

alleviate the lack of socio-political perspectives in science education for African American stu-

dents, the handbook of science research confirmed that it has "been the least well-taken-up as-

pect of CRP" where science is concerned (Johnson and Eisenhart, 2014, p. 65).

Other reasons cited in the literature for the lack of research in this area included: a) the

undervaluing of issues concerning minoritized populations and their liberation through educa-

tional measures; b) many people's general acceptance of the educational system's tailoring to a

dominant Eurocentric culture; and c) the comparably minimal amount of research that do not

take a deficit approach when addressing the underrepresentation of African Americans in the sciences (Walls, 2015). The literature also cited the lean existence of overall studies in science that focus on the African American population (Wall, 2015).

Furthermore, the science research that focused on African American populations and tackled hindrances caused by race or ethnicity were often clouded by the tendency of many of these studies to categorize all underrepresented racial or ethnic groups as one case. Many, therefore, lost sight of socio-cultural disparities even within these groups, thus limiting the number of studies specifically dedicated to the African American population (Basile and Lopez, 2014, Mutegi, 2011, 2013). Mutegi (2011, 2013) criticized research of this nature and pointed out that even the utilization of the term "women of color" masks the distinction between the different races represented under this category (i.e. Black, Latino, Asian, Native American), as well as the disparities in the societal treatment of those races. Mutegi examined Carlone and Johnson's (2007) study on the science experiences of successful women of color— which found that while some of the women became respected researchers in their fields, others used their scientific expertise for altruistic purposes. A third batch, Carlone and Johnson found, were those who experienced a much more difficult route to recognition and success, and therefore ended up in the "disrupted scientist" category.

Using Carlone and Johnson's (2007) study as an example, Mutegi (2013) proposed that a more socio-cultural or racially inclined analysis of the study's findings would have uncovered that no Black women ended up in the research scientist category, although four of the six women in the disrupted category were Black. A more critically inclined analysis, Mutegi assessed, would have also revealed the reason for this discrepancy to be racial in nature, in that Black people, as opposed to Asians or Latinos, are associated less with a scientific identity and therefore are not

recognized, validated, or encouraged to pursue its route. Mutegi recommended research efforts that seek to uncover educators' expectations of African American students within the scientific discipline and "how these expectations manifest themselves in the science teaching and learning of African American students" (p. 95).

Likewise, Codrington (2014), discussed the definitions ascribed to culturally relevant science teaching and critiqued the use of inadequate measures, such as standardized testing results, to gauge the effectiveness of pedagogical practices for African Americans. Codrington () stated that although standardized tests are biased and perpetuate the notion that knowledge is only significant if it is in alignment with European American expectations. Standardarized tests, more importantly, do not measure sociopolitical, critical consciousness, which is a more pressing educational goal for students from oppressed groups. In a response to Wallace and Brand's (2012) use of critical race theory to assess two middle school science educators, Codrington (2014) further questioned whether critical theories and socio-cultural pedagogical approaches such as CRP were being used in the classroom for the sole purpose of academic gain, or whether they were being utilized for the more crucial purpose of students' "future quality of life, position in society, humanity, and freedom from oppression" (p.1018). She suggested more inquiry into how the "practice of science can be deconstructed to demonstrate its political nature both historically and in contemporary times, and debunk the myth of natural science as universal, objective, and value-free" (Codrington, 2014, p. 1019). This dissertation study addresses this recommendation, as well as that of Mutegi's (2012).

Socio-political Science Education

As previously stated, the literature search did not reveal much empirical research on liberatory science education nor science studies based in the African-centered educational context.

Amongst the limited number, however, was Lee's (1992) profile of an African-centered school and its approach to all subjects. Although not recent, Lee briefly covered the basis of the Afrocentric approach to science, showing a systemic intertwining of content knowledge with philosophical and social principles, where science is "not a mere collection of disparate unit plans but rather part of a systematic way of viewing the universe and our relationship as humans to that universe" (p. 170). The African-centered science curriculum hence expressed the importance of animals, plants, organic and inorganic entities within scientific inquiries.

Studies on science teaching that embodied aspects of the African-centered approach, though, could be found categorized with educational efforts seeking social justice for marginalized ethnic groups. These were also few, however, and often based in the middle and secondary school contexts—again evidencing a need for more literature in the elementary setting. Among the limited number that could be found was as a study by Upadhyay's (2010) that focused on two female middle school teachers, and reported some practical ways in which these two teachers recognized their students' marginalized social position. Upadhyay's (2010) study also discussed the teachers' socio-political approach to teaching science to this group. Practical pedagogical examples given included their use of students' language and cultural beliefs as a tool to aid in students' comprehension. One notable example involved one teacher referencing her students' background during a discussion on viruses—where she invited students to discuss the Hmong belief that the human spirit can cause disease as much as a virus can. Other examples of cultural recognition included one teacher's acceptance of her Hmong students' categorization of purple and pink solutions as both blue—honoring the Hmong cultural trait of referring to all colors along the bluish spectrum as blue. An example of the utilization of scientific knowledge for socio-political purposes involved the teachers allowing the students to redesign, reword and make

more understandable for their community members a pamphlet that was sent out to their community to educate families about flu vaccines. The teachers also promoted the tenet of academic excellence by explaining to their Hmong students that, although their home knowledge was important and always applicable, certain inquiries in school needed them to specifically consider their school context.

Upadhyay's (2010) findings, although it can be utilized as a general example of culturally relevant socio-political approach to science education, was, however, still missing a focus on an African American student population. A study by Dimick (2012) that did focus on African American students, however, examined how student political empowerment was encouraged as part of social justice education in a high school environmental science classroom. Through classroom observations and a focus group of nine African American students, the study sought to find out the dynamics of this form of science teaching and followed the students throughout their efforts to restore a polluted river. Given the freedom to choose the avenue through which this could be accomplished, the students ultimately decided to organize a clean-up, make a public service music video, and develop a mix tape. Their efforts were not wholly successful, however; the findings revealed that although the students were excited and ready to implement their plans, they lacked the guidance for how to collaborate successfully.

The findings of this Dimick's (2012) study corroborated the necessity of equipping educators with the skills to facilitate sociopolitically inclined teaching. It also established the importance of balancing social, political and academic empowerment in science education (as is done in African-centered schools) and iterated how the undermining of any one of the three could prove counterproductive in the educational setting—especially in the case of African American students, when all three serve a crucial purpose. This study also did not focus so much

on the teacher's pedagogy or his pedagogical motivations as much as on the development of a social justice project and students' reaction to its trajectory and meaning. Dimick (2012) suggested more research on the practices of science teachers who take into consideration students' self, political and academic empowerment.

Another study that fell under this category and also resembled the African-centered approach to science was Buxton's (2010) study of urban youth at a science camp geared toward critical, place-based science learning. The goal of The Social Problem Solving through Science program (SPSS) was to give students a chance to explore issues related to science more thoroughly and to better their understanding of the political influences on their—and others'—everyday lives. Pre and post interviews of student participants before and after the program showed immense growth in students' perceptions and their understanding of complex issues. The study, however, did not focus specifically on the pedagogy of the teachers. Buxton (2010) also recommended more proactive efforts through which this approach to science teaching can be moved from the margins to mainstream classrooms.

African-Centered Schools

African-centered schools are the efforts of like-minded men and women who recognize mainstream schools' inability to fully address the needs of African American students. Their purpose is to provide educational environment in which the African American student is not culturally disenfranchised, mis-educated or integrated into a system that is oppressive to his or her sense of being (Woodson, 1933; Karenga 2003; Asante, 2003). Abiding by the Afrocentric notion of centrism, African-centered schools teach academic content, but from the African and African American perspective using African values (Lee, 1992; Piert, 2015).

The first African-centered school was established in the 1960s at the height of the Black power movement, when dissatisfaction with traditional educational conditions led to the need for a more proactive solution for African American students (Lee, 1992, Piert, 2015). Many more African-centered schools have come into existence since then, the majority of them small, some of them independent or private, and others converted into public charter schools (Piert, 2015). While they do not all utilize one specific curriculum, all African-centered schools operate on the "moral proposition" that "each child is capable of learning complex bodies of knowledge and problem-solving strategies, and that each child has the moral responsibility to use that knowledge for the good of his or her family and community" (Lee, 1992, p. 166). Many African-centered schools, therefore, adopt and are guided by Karenga's (1980) fundamental principles of African-centered education, also known as Nguzo Saba. These include the principles of Umoja (unity), kujichagulia (self-determination), ujima (collective work and responsibility), ujamaa (cooperative economics), nia (purpose), kuumba (creativity), and imani (faith).

African-centered schools also promote family-like relationships in the educational setting. Reciprocal love and respect between teachers and students, as well as proactive parental involvement, are emphasized, thus, in this setting (Piert, 2015). An appreciation of the separate but interconnected relationship between all people of African-descent is also emphasized, as well as the view that African Americans are a unique nation within the larger American nation (Lee, 1992, Piert 2015). The value placed on unity and community is thus manifested in the music, language, and dress of teachers and students, and in the terms used to address teachers and administrators (Piert, 2015).

The political approach to education is another important aspect of the African-centered educational initiative. In an interview with Lomotey, Peek reasoned that partisanship in education cannot be escaped because the educational system is set up for one to either be politically educated to represent one's own needs, or someone else's (Lomotey, 1990). In *The Miseducation of the Negro*, Woodson (1933) also argued that the American educational system's sluggish attempt in acknowledging and addressing African American students' educational needs is deliberate and political, in that the education of Black America is not meant to liberate but to subdue. He wrote:

> If you teach the Negro that he has accomplished as much good as any other race he will aspire to equality and justice without regard to race. Such an effort would upset the program of the oppressor in Africa and America. Play up before the Negro, then, his crimes and shortcomings. Let him learn to admire the Hebrew, the Greek, the Latin and the Teuton. Lead the Negro to detest the man of African blood--to hate himself (p.132).

Without stating its position, the traditional school system is thus covertly partial to Eurocentric cultural domination. However, recognizing the need to openly combat misconstructed ideas within and about the Black race, the African-centered educational initiative is overtly political in its agenda. Consciousness is engrained in students, and through emphasis on critical thinking skills, students are taught to question narratives presented in textbooks and other outlets. This agenda is also evident in its deliberate deviation from the societal perceptions of Black students as deficient and ungrounded (Piert, 2015). Students in African-centered schools are, thus, thought of, treated, and encouraged as capable, positive agents in their communities and beyond (Piert, 2015; Kifano,1996).

The case for African-centered schools. Although African-centered schools have existed for more than five decades, their presence as an educational institution is still seemingly misunderstood by the larger educational community. Misconceptions about its day to day operation threaten the viability of the African-centered approach as an example for effective, culturally relevant education (King & Swartz, 2014; Shockley, 2011; Merry & New, 2008). Questions have been raised about the inclusion of other cultures in its curriculum, as well as its ability to prepare students to interact, function, or compete with other students in non IBI (Independent Black Institution) colleges and universities (Piert, 2015). Others have attempted to quantify the effectiveness of African-centered schools through inappropriate measures that further solidify these misconception (Hilliard, 1990; Teasley, Crutchfield, Williams Jennings, Clayton, & Okilwa, 2016). Still yet, some have questioned the definitions of African culture on which African-centered schools are based (hooks, 1995; Merry & New, 2008; Walker, 2001).

One critique in the literature regarding African-centered schools' preference for a homogenous student body of Black students, for example, cited its voluntary separation as countering the fight against the segregation of Black students and regressing the efforts of civil rights activists who fought for these rights (hooks, 1995, Merry & New, 2008). Others cited the dangers of isolating African American students from a society into which they will have problems reintegrating (Merry & New, 2008; Piert, 2015). Yet, as proponents of cultural relevance have also argued, the purpose of desegregation was not to assimilate Black people into a culture that at best neglects their identity, and at worse, demeans it. The case for African-centered schools is that due to racists and classists systemic structures, many public schools, although not forcibly segregated by law, bear the characteristics of segregation (Darling-Hammond, 2010; Irvine, 1991;

Meiners, 2006; Noguera, 2003). White flight and inequitable distribution of resources have cre-

ated a form of de facto segregation of schools by race that leaves many predominantly Black

schools underserved and their students struggling academically (Darling-Hammond, 2010; Ir-

vine, 1991; Meiners, 2006; Noguera, 2003). Yet, these racially homogenous schools still operate

under hegemonic European traditions that continue to neglect the need for relevant curriculums

for their majority Black students—further debilitating African American students' sense of self-

worth, empowerment and agency (Fordham and Ogbu, 1986; Noguera, 2003).

Moreover, even in schools where the population's make-up resembles the racial and cul-

tural diversity romanticized by the ideals of desegregation, tracking systems and lowered expec-

tations of Black students within these schools are just as dire (Noguera, 2003). The lack of rele-

vant curriculums pertaining to African American students, and a Eurocentric culture that treats

African American students as problematic, foster inequities that cannot be resolved without a

specific and direct address of the educational needs of African American students (Asante, 2003;

Gay, 2000; Ladson-Billings, 1995; Noguera, 2003)

Another critique of African-centered educational solution cited its essentialization of the

African-descent identity as problematic (Gates, 1996; hooks, 1995). This critique centered on the

reality that not all people of African-descent share a cultural identity in the simple sense, in spite

of a shared history and origination from the African continent. Cultural differences exist between

ethnic groups even within the African continent, and often times there are vast differences be-

tween tribal groups within the same country (Merry & New, 2008). The critique of the African-

centered perspective, thus, was of its seemingly linear definition of what African culture entails

exactly. This critique led to a question of which aspects, out of the many, many African ethnici-

ties and cultural characteristics, African-centered schooling is choosing to emulate. Other critics

also questioned whether African-centered educational aims should be focusing less on the historical significance of the African American identity (as connected to the African continent), and more on the currently hybrid identity of African Americans that has been refined by other cultural influences within the American tapestry (hooks, 1995; Walker, 2001).

The fixation on specific definition, however, neglects the position that there is a shared ethos amongst all people of African-descent both inside and outside of the African continent—including some communities of color who do not immediately identify themselves as African (Boykin 1986, 2000; Gay 2000, 2002). This shared ethos therefore makes it possible for African-centered schools to generalize their approach to learning. Additionally, because the Afrocentric philosophy is focused on a unification of all people of African-descent in spite of acute cultural differences, the aim of African-centered schools is to celebrate all African cultures, while instilling in their students the rich heritage from which they were historically displaced (Asante, 1988, 2003; Lee 1992, 1994).

The most convincing critique of African-centered schools concerned their ability to ensure the academic readiness of their students. Some cited the difficulties students may have in later attending other traditional institutions that are not as centered on African identity. Others cited cases where some African-centered schools have not met standardized testing goals—arguing that the African-centered curriculum may be instilling cultural competency in its students at the expense and neglect of other academic needs (Teasley et al, 2016). Firstly, however, the insinuation of academic underperformance in African-centered schools was proven untrue in several cases (Alexander-Snow, 2011; Green-Gibson & Collett, 2014; Marks, 2005; Wiggin & Watson, 2016). Secondly, the Afrocentric perspective, and other critically oriented viewpoints, are

not in disagreement with the need for oppressed populations to be competent in traditional academic standards—especially when there is a socio-political advantage to be gained. Freire (1996) stated that oppressed minorities

> …need to learn the so-called dominant syntax for different reasons. That is, the more the oppressed, the poor people, grasp the dominant syntax, the more they can articulate their voices and their speech in the struggle against injustice (Literacy.org)

The issue, however, is the use of standardized tests as an all-encompassing gauge for the academic aptitude of all groups, in all settings, under all circumstances. Standardized tests are an inadequate assessment tool even for traditional contexts because of the often-subjective nature of its content, and because of its incompatibility with non-European students' point of reference (Hilliard, 1990; Menken, 2010). In the African-centered context, incongruence with standardized tests is even more significant—in that, the African-centered ideology deviates from hegemonic, Eurocentric content, and teaches historical accuracies and cultural referents often unreflected on mainstream standardized tests (Hilliard, 1990; King & Swartz, 2014; King, 2015). Thus, while, again, the myth of academic underachievement in African-centered schools has been disproved, quantitative, standardized measurements do not adequately assess the total effectiveness of the African-centered practices because they fail to consider their unique academic agenda.

CRP tenets in African-centered Schools

In spite of the critiques against African-centered schools as viable examples, however, the limited amount of studies on African-centered schools evidenced their dedication to the very same tenets espoused by CBPTs, and the successful execution of these tenets (James, 2007; Johnson, 2016; Wiggan & Watson, 2016). Ladson-Billings (2011), for example, defined the CRP tenet of cultural competence as

helping students recognize and honor their own cultural beliefs and practices while ac-

quiring access to the wider culture, where they are more likely to have a chance of im-

proving their socioeconomic status and making informed decisions about the lives they

wish to lead (p. 40).

Johnson's (2016) study of an African-centered educational program found that the program not only improved their cultural competence, but also their self-perception and their self-acceptance. The study, which utilized student journals, surveys of students' responses and data from researcher observation, also found that the programs' goal of giving students culturally relevant scientific understandings aided sixth and seventh grade students to master "complex science concepts quickly because it meant connecting their lives and their skin to something positive for a change" (Johnson, 2016, p. 150). The influence of the curriculum on the continental African students—whom studies have shown feel an immense sense of neglect in the traditional setting—was a sense of pride, affirmation, and inclusion. Many students collectively reported that the program moved them to "standing up for themselves a little bit more, but without being violent about it" (Johnson, 2016, p. 152). Although Johnson warned against beliefs that programs such as the one in the study could resolve all educational issues, the data revealed that by immersing African-descent students in their history and by teaching them about their origins, there was a "tremendous emotional shift in students who were now calmer, more receptive to ancestral teachings, and eager to make personal changes" (Johnson, 2016, p.153).

Studies also evidenced the positive impact of the African-centered approach on students' academic competence (Marks, 2005; Potts, 2003; Clarkson & Johnstone, 2011). A recent comparative study by Wiggin and Watson (2016) found that students in urban African-centered private schools that utilize anti-hegemonic, culturally responsive curriculum achieve higher scores

than their fellow students in surrounding public schools. Likewise, through a causal comparative design, Green-Gibson and Collett (2014) used the mission and philosophy statements, description of curriculums, and the state report cards of two predominantly African American public schools to determine the influence of an African-centered approach on students' academic performance. They found that the students in the school that infused African culture through an African-centered curriculum had higher standardized tests results than the school that did not use African-centered means. These studies attributed the difference to the increased sense of confidence and self-efficacy students in African-centered schools experience through the positive focus on their cultural identity and their histories. It was also attributed to the level of rigor often observed in the African-centered educational environment, including the pedagogical practices of its teachers. In Wiggan and Watson's (2016) study on for example, one student asserted that the rigorous practices in the school bred greatness in its students because they were required to "work for it" (p. 784).

With regard to academic competence, a study by Lee, Lam and Jumale (2014) also researched the presence of Ogbu's (1978; 2003) "acting white" phenomenon in one African-centered school and found that the isolation experienced by high achieving students in mainstream settings was somehow absent in the African-centered school. The researchers attributed the difference to an atmosphere where the "academically-oriented and college-bound culture is shared by students" (p.132) and to the inclusive curriculum of African-centered schools that recognizes the African continent, and pedagogical practices that unite and engender the African spirit regardless of student origin.

The development of critical perspectives in students and the encouragement of students to challenge social inequities was also found to be an essential part of African-centered schools—

although that is not surprising, being that it is also an essential aspect of the Afrocentric and African-centered educational initiative. Wiggan and Watson (2016) labeled what they observed at an African-centered school as emulating the characteristics of Culturally Responsive Critical Theory (CRCT), where its anti-hegemonic approach had "moved beyond basic multiculturalism, which often only additively teaches students about proverbial non-White heroes and special holidays" (p. 770). Several studies that focused on the teachers in African-centered schools, as well as other studies that focused on students' perspectives also found that they actively infuse this tenet in their pedagogy (Shockley 2011; Swain, 2011; Piert, 2015).

Afrocentric Curriculum Design

The push for culture-based pedagogical theories in mainstream schools has produced positive outcomes for student groups who were previously neglected as a result of the culture and content in American schools (Akua, 2017). However, the Afrocentric perspective is still critical of the mainstream efforts at inclusion and maintains that the turbulent history of Africans in America demands more involved efforts where African American cultural presence in the American curriculum is concerned. Nobles (1990) stated that the foundations of the traditional American curriculum have produced a Eurocentric standard that has created a "cultural chauvinism continuum" (p. 5) that has positioned some cultural groups as needing to be manipulated before they can be educated. He pointed out that haphazard efforts to politically address the lack of diverse perspectives in the mainstream curriculum is a result of a collective unawareness that curriculum in itself is a cultural experience and a cultural entity. In agreement with others who have lamented the issue (Ladson-Billings, 2005; Gay, 2013; Irvine, 2010) he attributed this unaware-

ness to the faulty interpretations of curricular inclusiveness and stated that much would be re-solved if educators specifically, and people in general, would understand that where education is concerned, culture comprises more than representational figures, holidays, music and dance.

The Afrocentric perspective further maintains that the misrepresentation—and often blatant omission—of the Black race from the American curriculum is an effect of a much deeper issue that goes beyond mere misinterpretation of cultural infusion. The problems with the current traditional curriculum is a result of a more calculated historical practice where false, demeaning, Eurocentric ideologies were used to justify the manipulative practices that subjected Africans to maltreatment and exploitation (Hilliard, Payton-Stewart & Obadale Williams, 1995). Hilliard (1991) posited that the importance of an African American presence in the curriculum, hence, not only serves the general need for a multicultural dimension that takes into account the diverse nature of the American population, but also serves as a corrective measure of the many wrongs that have been committed against the Black race and are being perpetuated by educational texts. He further stated that pluralistic multicultural education must be pursued, not for superficial or political reasons, but in the spirit and assumption that "there is truth in the whole of human experience" and that "nothing less than the full truth of the human experience is worthy of our schools and our children" (Hilliard, 1991, p.14).

The Afrocentric perspective on curricular development, therefore, argues that instead of truly presenting democratized knowledge in textbooks and telling a balanced story through the history of all who were present, the current multicultural educational efforts rather insert other cultures within a Eurocentric master script (King & Swartz, 2014; Asante, 1988). Hence, while

current educational textbooks—the proprietor of what is to be held as societal truth—tout an inclusive model that is representational of all cultures, the representations are a shallow mockery of what a true—and truthful— multicultural curriculum should entail.

As a remedy to the deficient traditional curriculum, the Afrocentric proposal is for an alternative that tells a story of the African people in holistic terms and diligently allows children to question who they are, where in the world they are, and how in the world they got where they are (Hilliard, 1995, p. xxii). Hilliard (1995) proposed that teachers master the African story, so to be properly equipped with the knowledge and principles necessary to teach effectively. The African story is then to be woven into the curriculum, with a support base of appropriate books, videotapes, maps, artifacts, film, audio materials, charts, and graphs, field trips, special programs, creation of resources, community awareness and participation, and a structure to support the continuity of these efforts. These efforts are then to be accompanied by the understanding that "any serious effort to rectify 400 years of academic wrong must be supported by appropriate resources of information and by a major effort" (p. xxiii).

Karenga (1997) also defined true cultural inclusiveness for African Americans in this manner:

> To truly dialog with African culture means, first of all, using it as a resource rather than as a mere reference. This is the meaning of posing questions and seeking answers within African culture concerning central issues of life and the world. To simply use African culture as a reference is to name things considered important, but never to use it to answer questions, solve problems, or extract and shape paradigms of excellence and possibility in thought and practice. To dialog with African culture, then, is to constantly engage its texts, i.e., its oral, write, and living-practice texts, its paradigms, its worldview

and values, its understanding of itself and the world, in an ongoing search for ever better answers to the fundamental questions and challenges of our time. (p. 162)

Asante (1990) in defining Afrocentricity as "the study of African concepts, issues and behaviors" (p. 49), clarified that, unlike other terms such as Africanity, Afrocentricity "seeks agency and action" (p. 49). He, in agreement with others, specified the Afrocentric educational curriculum as one that locates African people at the center of a phenomena, not at the sidelines where they provide supportive roles to the grand narratives (King & Swartz, 2014). The African-centered approach replaces the single European story with a balanced perspective of events, while at the same time emancipating those of African-descent from hegemonic ideologies (Asante, 1988). As a remedy to the traditional curriculum, Asante (1988) suggested one that uses as its base the big ideas of various Afrocentric philosophical thought, and proposed an emphasis on collective consciousness, collective responsibility, centrality, self-determination, subjects with agency, and reclamation of cultural heritage.

Although it originates from a passion for the African American educational initiative, the Afrocentric approach to curriculum construction can be shifted to place in its center any other cultural group that is lacking an equal presence on any platform (Asante, 1988). In an analysis of Social Studies texts, Swartz and King (2015) stated that many others have been systematically silenced by male dominated Eurocentric narratives in curricular materials (King & Swartz, 2015), including "indigenous Americans, Africans, poor Europeans, and all women" (p.18). They argued that through the Afrocentric approach to curriculum development and the Afrocentric concept of centrism, the voices of these groups can also be heard if their experiences are placed at the center of historical narratives.

The Afrocentric educational thought, however, has proven to be too zealous for some who have accused the philosophy of seeking to banish white supremacy by installing in its place a form of black supremacy that is just as racist and denigrating of others (Crouch, 1996; Lefkowitz, 1996; Ravitch, 1990). It is from this oppositional perspective that the term Afrocentrism (often mistaken as a synonym for Afrocentricity) originates. However, while opposers of Afrocentricity utilize the term Afrocentrism to argue that it aims to take the place of Eurocentrism, this is not the case (Asante, 2007). Ravitch argued that versions of Afrocentricity "veers toward racism, with its specious claims about the superiority of those whose skin is darkened by melanin and its attacks on whites as the 'ice people'." (p. 273). Ravitch (1991) also criticized the Afrocentric ideal of centrism as promoting racial segregation, and stated that:

> The "multiple -centrisms" approach, is in its way even more dangerous, because it is insidious. The "multiple -centrisms" position is superficially appealing, because on the surface it gives something to everyone: African Americans may be Afrocentric, Asian Americans may be Asiacentric, Native Americans may be Native Americentric, and Latinos may be Latinocentric, while those who are of European descent must be taught to feel guilt and shame for the alleged misdeeds of their ancestors. (cited in Asante, 1991)

Other critics have, additionally, contested the complexity of the Afrocentric philosophy and the feasibility of incorporating all its tenets into the mainstream American curricular structure as it now stands (Verharen, 2000).

Asante, however, stated that the Afrocentric proposal for a more democratic perspective in educational materials does not seek to contest an educational structure that is not already problematic (Asante, 1990; Asante, 2003). Asante (1990) further clarified that Afrocentricity is not anti-white, but pro-human, in that it is against racism, ignorance, and monoethnic hegemony

(Asante, 2003, p. 48). The Afrocentric idea, hence, does not take away from the right of children of European descent to also be centered in their own culture. Those who have a right to the Euro-centric cultural perspective, Asante asserted, "must not, however, be permitted to impose that view as universal" (Asante, 1990, p. 141).

Curriculum and Pedagogy

Although this study looked at how the Afrocentric curriculum in African-centered schools manifest in the practices of its teachers during science instruction, it did not take for granted the factors that impact this process. This section reviews some relevant literature on the impact of curriculum on pedagogical practices, and the Afrocentric perspective on the matter. It, then, concludes with the significance of this study in relation to the research currently available on curricular impact on teacher practice in the African-centered educational setting.

Curriculum and Pedagogy. Curriculum and teacher pedagogy are inextricably linked to an extent, but they are, in fact, separate entities that typically stem from separate sources (Wiggins & McTighe, 1998). Teacher pedagogical practices originate from teachers' own epistemological beliefs about learning (Wiggins & McTighe, 1998); curriculum, on the hand, usually originates from sources outside of the teacher's control. Curriculum and pedagogy, hence, can exist as opposing forces where one may dominate the other to the benefit or the detriment of the desired goal of student learning. Because teachers' beliefs drive their actions and how they interpret a given curriculum, these beliefs also play a large role in the extent to which curricular tenets manifest in teaching and classroom practices (Fullan, 2007). Cobanoglu and Capa-Aydin (2015), for example, found that educators were more likely to self-report adherence and fidelity to a mandated constructivist curriculum if it aligned with their own constructivist beliefs about student learning. Likewise, Land, Tyminski and Drake (2015) investigated the curricular material

features teachers attended to the most and found that participants in their study tended not to read the text provided with curricular materials in the educative sense as it was intended, but rather descriptively. Lambert, Velez, and Elliot (2014) also found that teachers' inclination to prioritize the local needs of their students over the mandated curriculum led to curriculum content being left uncovered.

Teacher pedagogical practices that stem from teachers' epistemology, however, are not inflexible and can be highly impacted by curriculum content given sufficient measures. Negative impact on pedagogical practices was documented in cases where punitive standardized testing mandates led constructivists teachers to increasingly emphasize silent work, whole group instruction and fact memorization in the effort to meet state standards (Clark, 1996; Hancock & Kilpatrick, 1993, Herman & Golan, 1990; Kempf, 2016). Positive shifts in pedagogical practices due to curriculum impact was also found to be true in cases where the curriculum responded to the needs of a specific group. For example, after providing teachers with specific strategies for the teaching of English Language Learners, Cervetti, Kulikowich and Bravo's (2015) found that the teachers in the treatment group, compared to the teachers who were not given the strategies, used an increased and wider range of instructional strategies, and overall adapted their pedagogical practices significantly to include their new-found knowledge. Likewise, other studies found that the mere introduction of novel strategies for improving student outcomes was often a catalyst for a change in teacher pedagogical practices. One study (Wyner, 2013) of science teachers who were given a new curriculum that incorporated real data and media found that when the curriculum provided viable tools to improve instruction and eliminated generalizations by giving specific examples of the phenomena to be taught, teachers were responsive and changed their teaching strategies to reflect the curriculum.

African-centered Perspective on Curriculum and Pedagogy. The Afrocentric perspective is that for a classroom to embody the true philosophy of African-centered education, teachers must be of a mindset that connects to the Afrocentric ambition of prioritizing student identity (Asante, 2003; Cokely, 2003). From the Afrocentric educational perspective, however, epistemological alignment with curricular demands is only partly sufficient (Asante, 2003; Cokely, 2003). Beliefs do not always constitute competence or knowledge, and for the Afrocentric agenda, neither does it suffice to have a general understanding of the African American experience (Asante 2003; Cokely, 2003). Asante (2003) asserted that it is vital for teachers to relinquish their own Eurocentric educational experiences through an understanding of, and a familiarity with, important African American historians. Teachers must also be equipped with the knowledge to deconstruct ideologies and untruths accepted and perpetuated by others in society. The quality of the knowledge that teachers acquire, thus, is just as important as their epistemological orientation (Lee, 1992; Asante, 2003).

In agreement, Lee (1992) outlined from a collection of leading Afrocentric works ten tenets that teachers of African American students must possess in order to bridge the disconnect that can exist between curriculum, epistemology and knowledge:

1. The social ethics of African culture as exemplified in the social philosophy of Maat.

2. The history of the African continent and Diaspora

3. The need for political and community organizing within the African American community

4. The positive pedagogical implications of the indigenous language, African American English

5. Child development principles that are relevant to the positive and productive growth of African American children

6. African contributions in science, mathematics, literature, the arts and societal organization

7. Teaching techniques that are socially interactive, holistic and positively affective.

8. The need for continuous personal study

9. The African principle that "children are the reward of life".

10. The African principle of reciprocity; that is, a teacher sees his or her own future symbiotically linked to the development of students (p. 167).

Beyond knowledge and epistemological alignment, however, is the art of translating the curriculum into practice. Lee stated that "just because one is knowledgeable about Black history and culture and likes children does not mean one can effectively teach using an African-centered pedagogy" (Lee, 1992, p. 167). The potential of any curriculum lies not in its raw content, but in how the content is translated into the learning environment. Teachers with an African-centered worldview take into account the African American linguistic and cultural tendencies; this consideration impacts how instruction is organized, and therefore plays a crucial role in how curricular requirements manifest in the classroom. Lee (1992) stated that the value of African-centered pedagogy is in its "linking of content knowledge in subject areas to philosophical and social principles" (p. 168). Hence, while all African-centered schools may not utilize the same curriculum, the shared grounding in an Afrocentric approach necessitates a pedagogy that:

1. Legitimize African stores of knowledge;

2. Positively exploit and scaffold productive community and cultural practices;

3. Extend and build upon the indigenous language;

4. Reinforce community ties and idealize [the concept of] service to one's family, community, nation, race and world;

5. Promote positive social relationships;

6. Impart a world view that idealizes a positive, self-sufficient future for one's people without denying the self-worth and right to self-determination of others;

7. Support cultural continuity while promoting critical consciousness;

8. Promote the vision of individuals and communities as producers rather than as simply consumers. (Lee, 1992, p. 166)

Many intricacies, thus, come together to make the African-centered pedagogy a valuable point of reference. In fulfilling the Afrocentric educational requirements, teachers in African-centered schools inadvertently hold a pedagogical repertoire worthy of exploring or emulating. Several studies provided examples of this merging of pedagogy, content, and principle in African-centered schools. Some examined the phenomenon on the school wide level (Watson, 2016); others touched on the topic en-route to investigating other aspects of Afrocentric education (Piert, 2016; Swain, 2011). The intention of these studies, however, was not to explicitly relate the practices of African-centered schools to the need for more authentic examples of culturally relevant teaching in the traditional educational setting. Unlike this current study, thus, these studies did not find the need to connect the African-centered curriculum directly to the practices of a teacher who uses it, nor the need to ask participants to specifically and overtly explain how this transition from theory to practice comes to be. This study contributed to filling that gap in the literature.

Summary

This chapter reviewed the previous literature regarding the need for CBPTs for students of African-descent. It also reviewed literature that confirmed the misinterpretation of CBPTs by many teachers in the traditional educational setting, the misapplication of CBPTs in science education, and, especially, the neglect of the socio-political aspects of CBPTs in the sciences. The literature, thus, confirmed the necessity of this study. It revealed not only a dire need for practical examples of CBPTs in the classroom setting, but also the viability of the African-centered educational philosophy—and the practice of this philosophy—as an example to elementary science educators who struggle with this merging of theory and practice. In chapter three, I discuss the theoretical framework that guided this study, as well as the methodology through which this study was conducted.

3 METHODOLOGY

This chapter provides an in-depth description of this study's methodology, framework, study context, participants, data collection and analysis procedures, validity measures, and ethical considerations. The purpose of this study was to examine the practices of an elementary education science teacher in an African-centered school, and how she translates the African-centered curriculum into effective instructional methods, in a discipline as seemingly culture-neutral as science. This study also explored the ways in which African American students' socio-political identity is recognized during science instruction. With the intention of making transparent the thought process involved in translating a culturally relevant educational philosophy into practice, this study further inquired from the teacher the rationale behind her pedagogical choices. Utilizing the qualitative case study methodology, the research questions for this study were as follows:

1. How do the ideals in an African-centered science curriculum manifest in the pedagogical practices of a science teacher in an African-centered school?

2. How does a teacher in an African-centered school address the socio-political aspects of the African American identity in her pedagogical practices during science instruction?

3. What is the teacher's perspective on her pedagogical choices in transferring the African-centered curriculum into practice during science instruction?

Theoretical Framework

The Afrocentric theoretical framework guided the focus of this study and the methodology through which it was addressed. Afrocentricity posits that all matters concerning people of African-descent must be addressed with the African-descent perspective in mind; it also challenges Eurocentric paradigms on the basis that they are the product of a society that is racially

and culturally stratified to the privilege of some, and the detriment of others. As explained by Richards (2007):

> Contrary to the propaganda of academia, white social theory do not represent a universally valid and "objective" body of thought, nor a neutral tool to be used for the purposes of understanding human experience. It might be argued, instead, that it represents a particular view of the world as seen from the perspective of supposed Western European superiority, and that an image of the inferiority of African civilization is inherent in the terms, definitions, and theoretical models on which white social theory is based (p. 86).

The Afrocentric worldview in all arenas, hence, aims to deconstruct accepted models that perpetuate the imposition of the Eurocentric culture on all others, namely those of African-descent. Modupe (2003) emphasized that "first and foremost Afrocentricity is a theory about African development, psychic and cultural, of the person and of the people, as African. Therefore, African development is Afrocentricity's ultimate objective" (p. 57). This ambition is true in all capacities of society (such as education) and in the frameworks that ground the research of people of African-descent in these capacities. In research or in practice, three criteria—centrism, critical analysis, and consciousness—dominate the Afrocentric theoretical perspective (Asante, 2003; Karenga, 2003; Kershaw, 2003; Modupe, 2003). Under these three, however, are other essential components that further influence its perspective on education. They are discussed in further detail below.

Centrism. The concept of centrism, or centeredness, in the Afrocentric paradigm begins with the knowledge and understanding of the histories, the cultures and the perceptions of people of African-descent (Kershaw, 2003). In the Afrocentric educational or research framework, the educator or researcher who possesses these prerequisites is then able to utilize this knowledge in

understanding the phenomenon to be addressed. This then ensures results that are not influenced by an incongruence between the phenomenon and the framework used to examine the phenomenon. In this way, centrism resolves the problematic issue of Eurocentric assumptions being used to address issues concerning people of African-descent (Asante, 1988, 2003; Richards, 2007, Kershaw, 2007). It also resolves the problem of these Eurocentric assumptions rendering the African as an object, as opposed to the subject, of educational or research efforts—a difference that is crucial and impacts the tone and the implications of such efforts. As stated by Asante (2003):

> Unless they are subjected to severe criticism, the preponderant Eurocentric myths of universalism, objectivity, and classical traditions retain a provincial European cast. Scholarship rooted in such myths obviously lacks either historical or conceptual authenticity. The aggressive seizure of intellectual space, like the seizure of land, amounts to occupying someone's else's territory and claiming it as one's own. When this occurs, cultural analysis takes a back seat to galloping ethnocentric interpretations of phenomena. (p. 43).

A demonstration of the importance of centrism can, for example, be found in Kershaw's (2007) examination of Moynihan's (1965) study on the Black family structure. In his study, Moynihan had concluded that the matriarchal nature of Black families is unstable and is the cause of the educational failure of Black youth, the high crime rate in Black communities, and the problems faced by Black people in America. Kershaw (2007), however, pointed out that Moynihan's (1965) decentering of the Black family structure and his comparisons of Black and White family structures disregarded the historical pattern of adaptability within Black families. She elucidated that women in Black families take the lead when necessary—a practice which actually symbolizes an egalitarian relationship in Black families as opposed to a matriarchal one. Kershaw further pointed out that in centering the Black family and their values in his research,

and in adopting a critical perspective of the matter, Moynihan (1965) would have found that institutional racism and unemployment are the cause for the seeming instability of Black families. Operating from an African American worldview, Moynihan would have also found that African Americans esteem the family institution as the oldest and most respected structure in their community, and do not consider it as unstable at all. Kershaw (2007) additionally pointed out that without regard for centrism, Moynihan's attribution of the school failure of Black youth to an unstable matriarchal family overlooked the educational structures that reflect an inequitable, racially stratified society; structures that cause Black youth to experience a different educational outcome from their White counterparts.

The notion of centrism, hence, recognizes the uniqueness of the African ethos, and sheds the Eurocentric position that a supposedly objective universal rationale can explain all phenomena in all contexts with all people (Asante, 1988, 1991, 2003; King & Swartz, 2014; Richards, 2007). Centrism therefore acknowledges certain dynamics in the African-descent community that Eurocentric frameworks do not account for or value. A study or an educational model that centers people of African-descent, for example, places importance on human relations, and does not presume to fully understand the individual outside of the collective group (Baldwin, 2007; Boykin, 1986). It also values human relationship or spiritual connection with the supernatural or supreme being (Akbar, 2003). Thirdly, it recognizes the need for one to seek happiness and harmony within one's self (Asante 2003; Baldwin, 2007; Modupe, 2003).

In assuring that efforts have centered those of African-descent, Kershaw (2003) suggested three questions that may be used for guidance:

1. How do Black people describe their lives?

2. How do Black people describe how their lives ought to be?

3. What do Black people see as obstacles affecting their opportunity to live the lives

they ought to be living?

This study acknowledged these criteria through its aim, design, and methodology. The decision

to use the African-centered school as the context also fulfilled these criteria, in that African-cen-

tered schools ensure that Black people will live their lives as they ought to be living it by offer-

ing an academic solution that emphasizes the history, culture and understandings of people of

African-descent.

Ultimately, in fulfilling its aim of centrism, this study did not simply assume, speculate or

deduce from textual factors or from researcher observation. Rather, this study allowed the story

to be told from the participant's perspective through additional methods of inquiry (i.e. dialogue

with the teacher regarding her motivations and rationale) (Kershaw, 2003). During the analysis

stage, this study further allowed the story to be told by those who "understand the conditions"

(Kershaw, 2003, p. 32) by extracting coding terms from the African-centered framework in use,

and also by engaging in constant clarification and member checking with the participant (figure
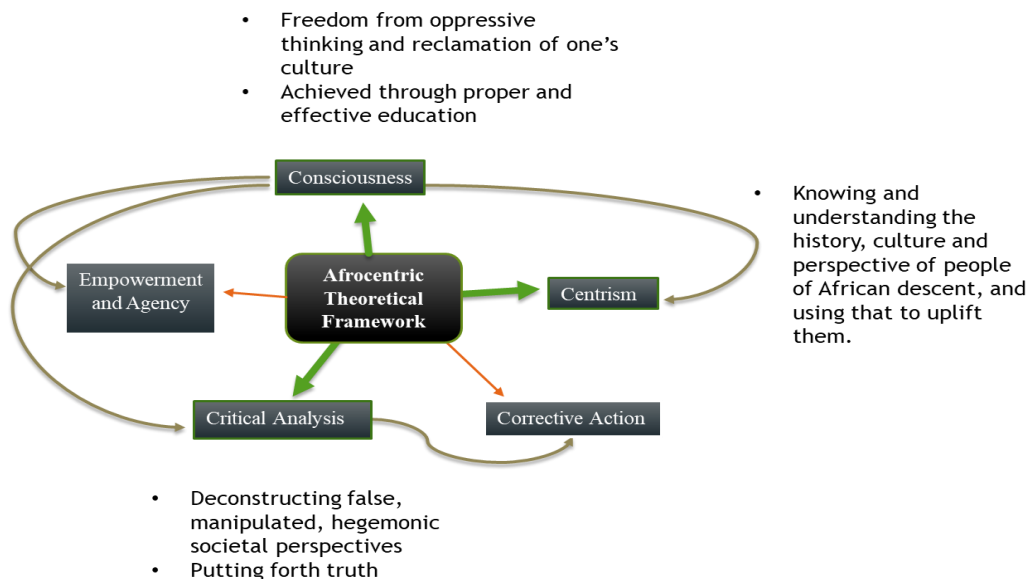
4).

Figure 2. *Components of the Afrocentric Theoretical Framework.*

Critical Analysis. Critical analysis in the Afrocentric perspective pursues truth in a society where inaccurate accounts continue to perpetuate racial stratification, inferiority notions, and cultural depreciation (Asante, 2003; Karenga, 2003). Critical analysis also aids in identifying real but often masked or intangible forces in society that impede the true liberation of people of African-descent. Karenga (2003) wrote that upholding a critical dimension in Afrocentric education involves the realization that

the greatest part of truth both rests and is continuously hidden beneath the surface, and that therefore, there is a constant need to reach beyond and below the surface manifestations of society and the world to penetrate and grasp the warp and woof of the relations which give them their motion, meaning and character (p. 61)

This involves repositioning normalized but hurtful societal practices and narratives. It also involves conveying the true nature of these practices and narratives, and then reconceptualizing them as problematic, oppressive or unjust (Asante, 2003; Karenga, 2003; King, 2015). The slave trade, for example, is often portrayed in textbooks as just another form of migration that brought African Americans to the Americas (Karenga, 2003; King, 2015). Due to its impact on the trajectory of the African American experience, it is necessary that accounts of the slave trade are truthful and accurate. By utilizing the art of critical analysis and calling the slave trade what it truly was— a holocaust, an act of genocide against African people—it "poses enslavement as an ethical issue rather than a commercial one" (Karenga, 2003, p. 84), and promotes relevant dialogue on the matter.

In the case of African American education, critical analysis also takes the form of calling conventional schooling what it truly is—a system that is rooted in one culture and renders all

other cultures subordinate. With regard to this study, it further takes the form of seriously examining efforts at culturally relevant teaching and challenging false presentations of cultural relevance (Conyers, 2003; King & Swartz, 2014; Ladson-Billings, 2005). This study, however, also acknowledges the component of corrective action, which advocates changing problematic structures through a merging of the educational arena and the African American community (Karenga, 2003; King, 2015). Corrective action pushes for the community to inform new understandings in education, as new understandings in education informs the community (Karenga, 2003). Corrective action is what is possible when African-centered educational practices are utilized as an example for culturally relevant teaching in the mainstream school setting.

Consciousness. Consciousness in Afrocentricity is summarized by Harris (2003) as "the way an individual (or people) thinks about relationships with the self, with others, with nature, and with some superior idea or Being" (p. 113). Modupe (2003) conceptualized consciousness as part of a matrix, where being conscious precedes—and leads— to psychic liberation (freedom from oppressive thinking that impedes development) and cultural reclamation (relating, pursuing, utilizing and participating in African culture). Consciousness within people of African-descent prevents their utilization of ideas and terminologies that separate entities of African-descent, diasporic and continental. Consciousness also removes the ignorance that leave people of African-descent at the mercy of Western interpretations of the African identity (Asante, 2003; Modupe, 2003). In this sense, consciousness can be said to encompass the components of centrism and critical analysis—in that it predisposes the person of African-descent to recognize him or herself outside of socially constructed impositions, and also solidifies within the individual the right to engage in critical analysis.

While consciousness is a state of being and a mode of operating, it is received and transferred through knowledge and literacy (Asante, 2003; Modupe, 2003). Consciousness logically underlies the African-centered educational objective, hence, and is evident in the practices of African-centered schools, as well as the socialization of their students (further discussed in chapter 2). Another important aspect of the Afrocentric educational philosophy is that of academic and cultural excellence, as well as the restoration of students' identity (King, Akua, Russell, 2014; Nasir, 2012). However, the Afrocentric desire is for all children, regardless of racial or ethnic affiliation, to harbor a level of consciousness that results from an accurate understanding of their own current and historical presence in society (Asante, 1991, 2002, 2003). Afrocentricity also desires for a consciousness in students that results from an affirmation of their identity in all aspects of their educational experience (Asante, 1991, 2002, 2003).

Consciousness is also just as necessary in educators. An absence of consciousness in educators is an absence in their understanding of the need for authentic affirmations of students' cultural identities (Asante, 2002; Lee, 1992). The presence of consciousness within educators, however, induces empowerment and agency, promotes a learning environment that embraces accurate depictions of students' culture, and promotes the development of critical perspectives in students (Asante, 199; Lee, 1992). Consciousness, thus, is applicable to teacher pedagogy, and is a necessary component for teachers in all educational settings.

Empowerment and agency. Empowerment and agency are logical consequences of consciousness, in that they result after one has come to a revelation or an understanding. Because change can only be realized through action, and because the Afrocentric educational philosophy aims to uplift the Black community through action, the ideals of empowerment and agency are

indispensable. The Afrocentric perspective, therefore, views the omission of these two elements—in any field— as direly problematic. Additionally, because empowerment and agency are only possible when one is exposed to the issues at hand, the Afrocentric framework holds that the lack of relevance in schools is disempowerment and hinders Black students' ability to identify with and uplift their community (Asante, 1991).

With regard to research, Kershaw (2003) defined empowerment and agency as "the responsibility of the researcher to move the research and the theory from the problem posing to the problem-solving stage" (p. 33). She proposed that this be done through educational efforts that can help eliminate the obstacles that inhibit the rightful autonomy of people of African-descent. While the limits of this study do not fully allow educational efforts of this capacity, this study contributes to these efforts by recognizing the agency of African-centered schools, their position as an answer to the educational obstacles faced by African American students, and their aim to empower and instill a sense of agency in new generations of Black students. Outside of such contexts, there is a general "need for empowered educators who can facilitate the development of democratic citizens of every creed and ethnicity who have the freedom to act, think critically, and make choices that will bring about changes in their lives and the lives of others in their communities" (Fournillier, 2012, p. 75). In facilitating an opportunity for teachers in African-centered schools to share their practices, it is the hope that the findings of this study will promote consciousness in other educators and empower them to effectively educate their African American students.

The Qualitative Case Study

This study utilized the qualitative case study methodology, which Yin (2018) defined as "an empirical method that investigates a contemporary phenomenon (the "case") in depth and

within its real-world context, especially when the boundaries between phenomenon and context may not be clearly evident" (pg. 15). Yin added that secondly, a case study:

- o Copes with the technically distinctive situation in which there will be many more variables of interest than data points, and as one result

- o benefits from the prior development of theoretical propositions to guide design, data collection, and analysis, and as another result

- o relies on multiple sources of evidence, with data needing to converge in a triangu-lating fashion. (p. 15)

A qualitative case study, thus, describes, explores or examines a phenomenon within its context. It utilizes methods such as observations or interviews in order to allow the researcher and the participant opportunities to interact and co-construct the meaning of the phenomenon being stud-

Particularistic:
Focuses on the particular situation of socio-politically inclined, culturally relevant science instruction for African-American students. It's "specificity of focus makes it an especially good design for practical problems - for questions, situations, or puzzling occurrences arising from everyday practice" (Merriam, 1998, p. 29)

African-Centered School

Case Study of African-centered Science Instruction

Descriptive:
Rich, thick and literal description of the pedagogy of sociopolitical, culturally relevant science instruction for African American students.

Heuristic:
Illuminates readers' understanding of socio-political, culturally relevant science education for African American students. Wishes to bring new meaning to socio-political science instruction, extend already existing meanings, or confirm what is already known about socio-political, culturally relevant science instruction for African American students.
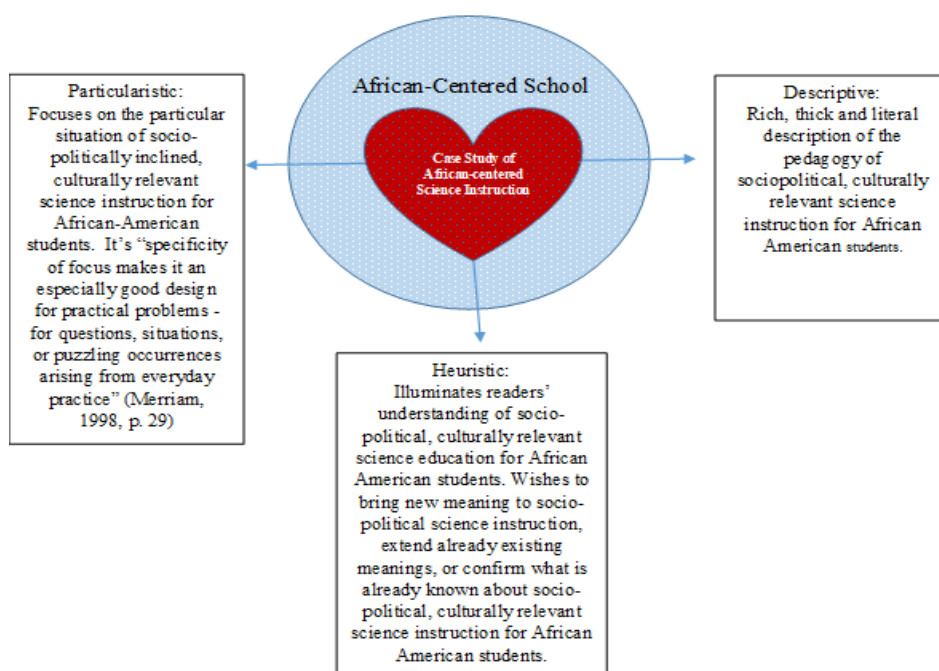
Figure 3. *Illustration of current study as a bounded case study.*

ied. The case study methodology is, thus, suitable for studies in which the researcher aims to emphasize participant perspectives. The case study methodology also highlights context as an integral factor in a phenomenon (Creswell, 2014; Merriam & Tisdell, 2016; Yin, 2018), and considers context as inseparable from the meanings and the perspectives that culminate into a case. As this study focused on one participant, it utilized methods suitable for a single case study, as opposed to a multiple case study. Likewise, a descriptive case study, as opposed to the exploratory or explanatory types, was chosen because of the goal to richly describe—illustrate with words—how a teacher translates a sociopolitically driven culturally relevant educational philosophy into practical classroom practices in any classroom setting.

This study's approach to the case study methodology was most akin to that of Yin's (2016, 2018). Yin clarified that case studies are intrinsically bounded. The subject of a case study can, thus, be represented as a heart in the middle of a circle, where everything outside of the heart, although related, will not be part of the focus (figure 3). An innovative program within a school can be an example of a bounded case within a larger context. Science education within the African centered school context, was, in the instance of this present study, the bounded case within the larger context.

Alignment with Theoretical Framework

Yin (2016, 2018) emphasized that the theoretical framework must be an essential determinant of a study's chosen methodology and methods. As previously mentioned, the qualitative case study methodology was chosen due to its suitability for this study's inquiry. It, however, was also chosen because of the alignment of its usual methods with the values of the Afrocentric research framework—which are that research involving people of African-descent must consider

their current and historical positioning in a Eurocentric society, consider how this positioning affects the integrity of research in the Black community, and consider the methods and perspectives that are necessary for the accurate study of this population.

More importantly, the case study methodology was chosen because it allows for an emphasis on the Afrocentric concept of centrism. Like the qualitative case study methodology, centrism also acknowledges and honors multiple perspectives and diversity in humanity and rejects the imposition of universal ideologies (Kershaw, 2003). It thus stresses methods that require the researcher to firstly shed the pretense of objectivity and instead embrace the essential ideal of reflexivity (Creswell, 2014; Kershaw, 2003, 2007; Merriam and Tisdell, 2016). Reflexivity is simply the process where the researcher examines him or herself as a product of societal, whose interpretation of a phenomenon is contingent on factors such as gender, race, age, ethnicity, and social standing (Creswell, 2014; DeWalt & DeWalt, 2011, Merriam and Tisdell, 2016). In the research of people of African-descent, reflexivity also allows the Afrocentric researcher an opportunity to be transparent about the partial, politically driven tone that the Afrocentric perspective believes is necessary in all studies concerning people of African-descent (Kershaw, 2003; 2007).

Like the interpretive and social constructivist basis from which the case study methodology emerged, the Afrocentric research framework also requires the researcher to be fully immersed and interactive with participants in the research environment. It staunchly advocates research methods that allow unbridled access into the motivations and understandings of participants, so participants can tell a story that is truly their own (Kershaw, 2003; 2007). The qualita-

tive case study methodology and Afrocentric approach to data analysis, thus, both emphasize inductive methods, where the rich collaboration between researcher and participant culminate into the study's final findings.

Context

The context for this study, the Asempa School (pseudonym) was chosen through purposive sampling, meaning that the school was purposely selected because it fit the criteria from which this study could benefit most (Yin, 2016, 2018). More specifically, this study used convenience sampling, which is a form of purposive sampling where the sample for a study is chosen because of its convenience. In this case, the chosen context was one of three African-centered schools in the area, but was the one that had availability of site, and a science teacher that would be available in the time frame of the study.

The Asempa School. The Asempa School was a K-8 African-centered institution located in southern United States. It was the vision of its founder and CEO, and began as a tutorial program that evolved into a full day program 3 years after the tutorial program was established. The Asempa School initially held two teachers and 13 children. At the time of the study, it served about 50 children, and had a staff of 7.

In many ways, the Asempa School was characteristic of many other African-centered schools (as described in chapter 2). It had a specific mission to be a culturally relevant educational environment that focused on academic excellence and instilled in students a commitment to social justice. It also had a philosophy based in African values, and utilized the principles of Ma'at (which is truth, justice, righteousness, order, reciprocity, harmony and balance). It additionally followed the principles of Nguzo Saba, and therefore promoted the values of umoja

(unity), kujichagulia (self-determination), ujima (collective work and responsibility), ujamaa (cooperative economics), nia (purpose), kuumba (creativity), and imani (faith). The Afrocentric emphasis on community and the importance of parental involvement were likewise present at the Asempa School. Parents were required to attend at least five to ten parent meetings a year, and volunteer twenty to forty hours per year.

Asempa's commitment to its mission and purpose as an Africa-centered institution was also evidenced in an everyday morning ritual where students recited the school's prayer, its affirmation, and its libation. The affirmation and the libation reinforced essential elements of the African ethos and highlighted Asempa's allegiance to the unity of all African descendants around the world, its spiritual acknowledgement of a higher being, and its socio-political dedication to the liberation of people of African-descent. The recitations were as follows.

4.   Daily prayer:

To the Creator of all things

Both Mother and Father

Known by many many names

Asante Sana, thank you for this day

Asante Sana, thank you for creating us in your

image

Asante Sana, thank you for giving us minds to

think,

Bodies to move

And

Spirits to rejoice

Help each of us contribute to the unity of this

place

Help us to be kind in word and deed

As we move closer

To the liberation

Of our people

Upenda na Uhuru

Love and Freedom

Ashe

5. *Daily affirmation:*

We are African children.

We are divine.

We are capable of doing all things.

We belong to the family of Africans worldwide.

We follow in the footsteps of our Ancestors.

We are on the wings of their greatness.

Individually we are strong,

But,

Collectively we are mighty.

We are committed to excellence.

We are committed to community.

We are committed to liberation.

We are empowered by the Creator and the Spirit of our Ancestors.

Oh! Nothing can stop us!

Freedom is ours!

Uhuru Sasa! Uhuru Sasa!

6.   Daily libation:

Oh Ancestors!

Blacker than the skies at midnight

Brighter than the noon day sun

and all the beautiful shades of Africa in between

Field hands, house servants, factory workers

Preachers, teachers, freedom fighters

Those who resisted in silence

Those who resisted out loud

Those whose bones are on the bottom of the Atlantic Ocean

Those who chose to survive

Great ancient priests, warriors, and mystic scientists

Give us the inspiration to fight a thousand lions

Give us the enlightenment to unravel the mysteries of the universe

Give us the sustenance to travel through the trackless swamps of disharmony

Praise be your Black African Names

Help us in our time of need

Ashe!

With respect to the science curriculum, the Asempa School utilized the core standards of the state in which they were located. The teacher participant also utilized the online resource Science A-Z. In order to fulfil its aims and purposes as an African-centered school, however, Asempa's subjects were also supplemented with a culturally relevant, African-centered curriculum created by the founders of Asempa School. This supplementary curriculum was not only for science, but was an in-depth, culturally relevant approach to teaching all subjects. The initial outline of this study indicated that, in addition to extracting themes from the Afrocentric educational philosophy, themes would also be extracted from the Asempa School's own supplementary African-centered science curriculum. However, due to confidentiality, Auntie Eneola, the teacher participant, could not utilize this supplemental curriculum in the duration of this study. Thus, Auntie Eneola only utilized a general science curriculum not unlike other textbooks in the traditional setting. Given that the Asempa school was founded on the Afrocentric educational philosophy, Auntie Eneola abided by the same ideals in which the supplemental science curriculum was rooted.

What transformed the general science content into being African-centered, thus, was Auntie Eneola's approach to teaching this curriculum, and the resolve on her part in acknowledging that the general curriculum was not complete nor inclusive of all forms of scientific knowledge from all people. Although this study's lack of access to the supplemental African-centered science curriculum initially presented itself as limitation, this lack of access ultimately held an advantage where the purpose of this study is concerned. This is in that traditional educators can better utilize this study's implications, without viewing their own lack of access to a supplemental African-centered science curriculum as a roadblock.

Participant

     Sampling. The participant for this study was selected through purposive sampling. The participant was a teacher who taught science in on the elementary level in an African-centered school. Because this was a descriptive case study with the specific goal of gaining knowledge about how the curriculum tenets come alive in teacher practices, the goal was to end up with an information-rich case "from which one can learn a great deal about issues of central importance to the purpose of the inquiry" (Merriam and Tisdell, 2016, p. 96). The participant, hence, was chosen based on the recommendations of school's administrators, and also based on her willingness to participate in the study.

     Participant. Auntie Eneola (pseudonym) was in her late twenties. Her own education was public, from kindergarten to 12th grade. She had a bachelor's degree in secondary education, specializing in English. She was pursuing a master's degree in applied linguistics. Eneola had been teaching for seven years. She taught at a different African-centered school for the first year of her teaching career, and had been teaching at the Asempa School for six years. She taught all subjects to the k-2 class at the Asempa School. For the third and fourth grade students, she taught only science. Auntie Eneola's epistemology included a belief that student-centered education is best. She believed every child must see herself him or in the narrative. Auntie Eneola also believed in the power of teaching—that all children are teachable. She believed in being an excellent teacher, which to her meant putting in her all, no matter what the students came to the classroom with. She also believed in collaborating with all entities necessary to do what is best for the success of all students.

Data Collection

My data collection methods included participant observations, and interviews. The following sections will elaborate further on these methods.

Observations. In keeping with my role as a researcher in the Afrocentric tradition, I joined the science classroom as a participant observer, where my active role as a participant in the classroom superseded that of my role as an observer (Creswell, 2014; DeWalt & DeWalt, 2011; Merriam & Tisdell, 2016). This meant obtaining permission from the administration and the teacher beforehand to function in the classroom as an assistant in whatever capacity the teacher participant deemed fit.

A limitation of participant observation, however, is that the observer impacts the environment being observed (Bohr, 1963; DeWalt & DeWalt, 2011). I was aware that my presence could alter the usual behaviors, interactions, and general affairs of the classroom to some extent. My strategy for alleviating some of this effect was to actively participate in the classroom for about 30 minutes prior to the period for which I needed to collect data (the science instructional time block), since the science teacher was also the teacher for other subjects. This was to aid the students and the teacher in adjusting to my presence as a participant observer, and, thus, allow for data that was more authentic and less impacted by my otherwise sudden appearance.

Descriptive and reflective notes. As an ongoing part of the data collection process, I recorded both descriptive and reflective notes. Reflective notes, described as "speculations, feelings, problems, ideas, hunches, impressions, prejudices, analyses, plans for future inquiry, clarifications, syntheses, connections, and other ideas" (Williams, 2011) was recorded immediately after the observation period was over and I had left the context—in order to avoid unnecessary anxiety from the participant about what was being recorded (Dewalt & Dewalt, 2011). All descriptive

and reflective notes were kept in a notebook specifically dedicated to data collected for this study.

Observation timeline. The participant was observed multiple times a week in a six week data collection time frame. Yin (2016) suggested that because analyzing case studies can be complex, using theoretical guidance for how to approach data analysis is the best strategy. Adhering to the Afrocentric emphasis on collaboration, therefore, data analysis was integrated with the data collection process in order to facilitate ongoing collaboration and co-construction between researcher and participant. I allowed time in between observations and interviews. During this off period, I took notes and organized instances on which I would like the teacher to clarify or elaborate during subsequent interviews. Taking breaks in between observations also allowed for variation in lesson topics being covered in the classroom, and, thus, promoted rigor in findings and implications.

Interviews. Interviews are necessary when participants' feelings or their interpretation of the world around them cannot be observed (Merriam & Tisdell, 2016). Pedagogy, the focus of this study, is a personal practice that, although open to influence, stems from teachers' motivations, rationalizations, and interpretations of occupational expectations (Wiggins & McTighe, 1998). Interviewing the participant throughout the data collection process made myself and future readers privy to these internal factors. Interviewing as part of the data collected also facilitated the rigor that is necessary for methodological trustworthiness and reliability. Dialogue with the teacher participant limited impositions of perspective and misinterpretation on my part, and instead allowed her to do as the Afrocentric approach suggests: tell the story. Ultimately, the interviews served to keep African-centered educational practices, as well as teacher interpretations of these practices, centered throughout the study.

Week 1 (Feb 5 – 9)	Week 2 (Feb 20 – 23)	Week 3 (March 19 – 23)	Week 4 (March 26-30)	Follow Up April 17, October 16
Initial Interview (15 min) • science curriculum • role as a science teacher • epistemology Observation 1 (45 minutes)	Observation 4 (45 minutes) Interview 2 (11 min) • Incorporation of biographies in science lesson. • Inclusiveness • Acknowledgement of all marginalized perspectives in science. Member check	Observation 7 (45 minutes)	Observation 10 (45 minutes)	Interview 5 and 6 (30 mins)
Observation 2 (45 minutes)	Observation 5 (45 minutes)	Observation 8 (45 minutes) Interview 3 (30 min) • The necessity of truth and information. Discussion of Flint water crisis during lesson on water cycle. • Not imposing teacher ideals on students. Member check	Observation 11 (45 minutes)	
Observation 3 (45 minutes)	Observation 6 (45 minutes)	Observation 9 (45 minutes)	Observation 12 (45 minutes) Interview 4 (30 min) • The level of student movement • Effect of movement on learning • Sociopolitical aspect of instruction. Member check	

Figure 4. *Overview of Study*

Interview structure. Two kinds of interviews were used for this study: unstructured and semi-structured. An unstructured interview is an open-ended, spontaneous conversation where "interviewees are freer to ask questions of the interviewers, who may divulge personal details and opinions of their own" (Roulston, 2010, p. 15). In semi-structured interviews, the interviewer uses as a guide a list of pre-generated open-ended questions, following up with others or probing as necessary (Merriam and Tisdell, 2016; Roulston, 2010). I conducted six face-to-face interviews with the teacher participant within the six-week data collection time frame. The first interview was introductory and unstructured, and served as a way to get acquainted with the participant before the journey ahead.

The subsequent interviews were semi-structured, permitting the participant to define her practices in "unique ways" (Merriam & Tisdell, 2016), while at the same ensuring that the ultimate focus of the study was being addressed (see appendix A). These interviews took place at the end of the school day, in the teacher's classroom. They were about 15 to 30 minutes in length. The first half of the interview addressed the day's observation period. The second half was used for clarification on previous observations and interviews, guided by the insights from my ongoing data transcription and analyses.

The very last interview served as an opportunity for member checking previous data and completed analyses. All interview sessions were recorded, and transcribed.

Data Analysis

Data analysis for this study was ongoing throughout the data collection process, and utilized the Qualitative Content Analysis (QCA) method. Schreier (2012) defined QCA as a "method for systematically describing the meaning of qualitative material" (p. 8). QCA stemmed from what was simply termed content analysis and originally used for the quantitative examination of themes and attitudes in mass media communications (Berelson & Lazarsfield, 1948; Lasswell, 1941), and psychological and educational research (Flesch, 1948; Martin, 1936; Simpson, 1936; Yule, 1944). In its quantitative form, though, content analysis focused highly on the frequency of themes in text, and regarded very little the complexity of textual meaning as "holistic, and context-dependent" (Schreier, 2012, p. 13). QCA on the other hand, although it appreciates frequency as an indication of significance, recognizes that infrequency is not an indication of insignificance. Additionally, QCA, unlike its quantitative counterpart, focuses on the latent and not always the literal understandings of data collected (Groeben & Rustmeyer, 1994; Nuendorf,

2002); it therefore identifies meaning in data as dependent on the context, the author, or the intended reader.

Rationale for use of QCA method. The goal of this study was to describe with concrete examples how the ideals of one African-centered educational philosophy manifests in the classroom practices of one science teacher in an African-centered school. A suitable method of analysis for this study had to, firstly, aid in identifying and analyzing the salient ideas in the African-centered philosophy in use at the school. Secondly, the method had to be able to connect instances in the classroom that demonstrate each idea, in order to illustrate concrete examples for how the themes in the curriculum are translated into practice through pedagogy. Thirdly, the chosen method had to be able to seamlessly incorporate into the analytical frame the motivations behind the teachers' pedagogical practices.

The QCA method satisfied these requirements. It was also chosen because it encompasses characteristics that preserve the integrity of the Afrocentric research framework—especially in its focus on meaning as reliant on context and author. QCA highlights that content in textual data is multifaceted and so meaning is not always apparent. QCA, therefore, can only genuinely be utilized through the adjustment and co-construction of meaning with participants. As emphasized by Schreier (2012), this puts a stress on researcher reflexivity and forces the researcher to "acknowledge your role in co-producing your data by making the grounds for your interpretation transparent so it can be shared by others" (p. 32).

QCA Data Analysis Process. As illustrated in figure 5, QCA requires the researcher to first identify the main categories into which themes or ideas from his or her collected data can be organized (Schreier, 2012). These categories are either generated from the data itself (data-driven coding), or from a conceptual or theoretical framework that guides the study (concept-driven
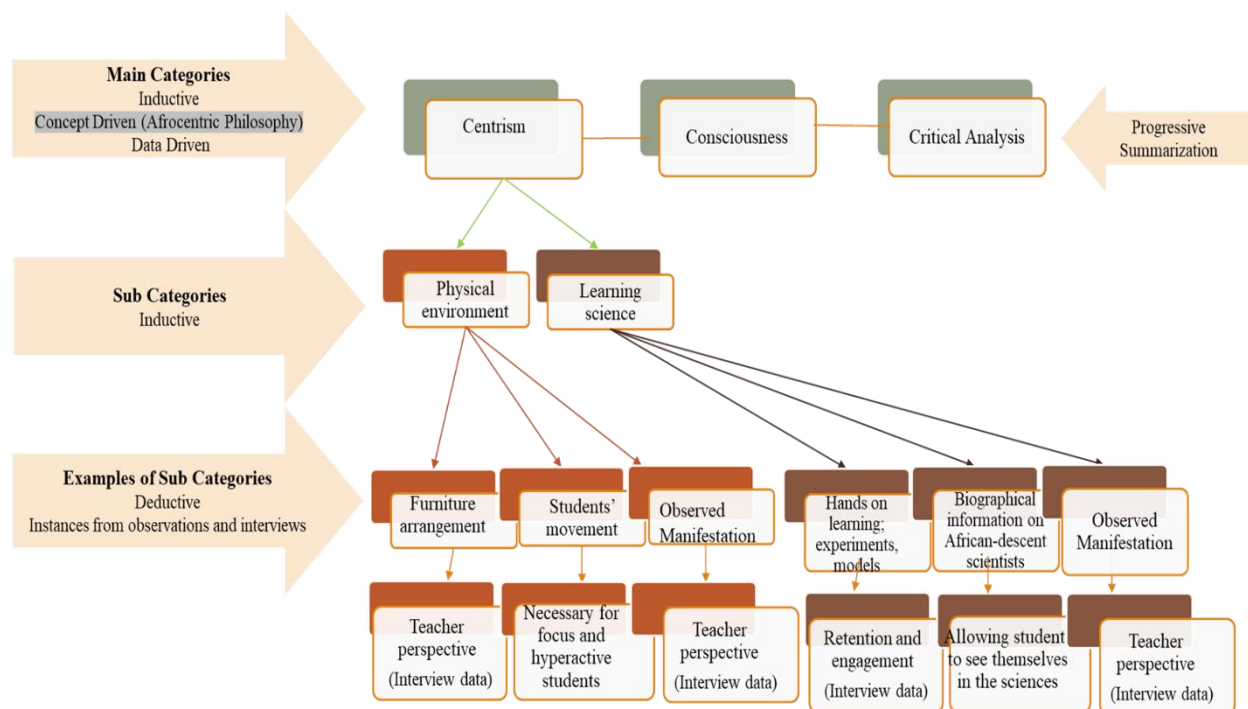
Figure 5. *Sample QCA data analysis categorization*

coding) (Schreier, 2012). Subcategories are then generated from the research data under each main category. All other instances of a subcategory are then filed respectively, creating an organized system where all important themes in the data are filed under a category that describes its nature. The following sections further explains the analytical processes that were used for each type of data collected.

Analysis of African-centered educational philosophy. An analysis of the African-centered educational philosophy began the data analysis process. I constructed a main coding frame using the concept-driven coding method (Schreier, 2012). The concept-driven method was utilized to allow into the main frame the imperative concepts of the African-centered or

Afrocentric educational philosophy (e.g. centrism, critical analysis, consciousness) (Asante, 2003; Karenga, 2003; Kershaw, 2003; Modupe, 2003). Schreier (2012) suggested using the progressive summarization strategy for generating the main categories for data-driven codes if codes have not been previously selected through other techniques. Because my main themes were already apparent from the African-centered/Afrocentric theoretical perspective on education, progressive summarization was not necessary.

In the next phase of analysis, I then searched for evidence or instances of these main categories (centrism, critical analysis, and consciousness) in my observation and interview data. These evidence and instances became the subcategories. They were categorized under the main categories as they emerged during the ongoing analysis of interview and observation data.

Analysis of interview data. As previously stated, data analysis was integrated with the data collection process, and so was ongoing. I transcribed all interviews (audiotaped) immediately after they are conducted. I rechecked all transcriptions for error. I then proceeded to analysis by coding and categorizing themes, quotes, and important points under their respective categories in the previously constructed frame. Immediate transcription of interviews also aided in my generating further clarifying questions for the next interview with the teacher. These questions largely requested elaborations on connections between the observed practices and the curriculum, and also on teacher's motives for pedagogical decisions. At the end of the data collection period, all interview transcriptions were recoded and re-categorized, as a form of checking for reliability (Schreier, 2012). Further discussion on reliability can be found in a later section on verification measures.

Analysis of observation data. As suggested by DeWalt and Dewalt (2011) I collected some written data while immersed in the context as a participant observer during the observation

periods, in order to prevent anxiety for the teacher and the students. I, however, took reflective notes after the observation period. Some of the reflective notes that I took after the observations were transcribed and coded if they contributed to the richness of later reporting.

Reporting

I used rich, thick description () in the reporting of my findings. Many scholars on case study research named rich, thick description as a benefit of the case study methodology. Merriam defined it as "the complete, literal description of the incident or entity being investigated" (1998, p. 30), and Yin (2016) instigated a "flair" in reporting the findings of one's case study (2016, p. 219). To aid in rich, thick descriptions of all aspects of the study, the final report is in narrative form, as is usually done with qualitative case studies (Yin, 2014, 2016, 2018). I also explicitly present the findings as follows: the curricular ideals, how they are manifested in the classroom, and the teacher's motivations for her pedagogical decisions. The research questions are ad-dressed as separate entities during the discussion and implications of findings in chapter five.

Data Management

With the sheer amount of data to be managed from different sources, researchers of case studies can be "seriously challenged in trying to make sense out of the data" (Merriam & Tisdell, 2016, p. 233). I alleviated this challenge by utilizing a filing systems. These files contained inter-view data and observation data. Copies of all raw and transcribed data were kept in these files, with a pseudonym for the participant. Electronic copies of all other transcribed and coded data were also kept on a computer. Yin (2014) referred to this as a case study database.

Measures of Verification

The quality of a qualitative study lies in the rigor and consistency within and among all parts of the research process, from the conceptualization of the study to the reporting of findings

(Creswell, 2014; Lincoln & Guba, 1985; Lincoln, Lynham & Guba, 2011, Merriam and Tisdell,

2016). For cases studies, four instances are especially necessary to address: credibility, transfera-

bility, dependability and also trustworthiness (Lincoln & Guba, 1985; Yin, 2016). In the follow-

ing sections, I discuss these instances and how they were addressed in this study.

      Credibility. Credibility, refers to how realistic or reflective a study is of the phenomenon

being studied. It ensures that the correct tools, methods, and measures have been used in bringing

about, as closely as possible, the real representation of what is being studied. Research, however,

will always suffer a limitation where exactness is concerned. DeWalt and DeWalt (2011), for ex-

ample, discussed how the researcher's presence in the research environment automatically alters

what is to be studied. Additionally, the researcher cannot be wholly sure that he or she is cor-

rectly interpreting what participants convey during interviews. Likewise, researcher perspective

can be limiting because researcher interpretations are often contingent on experiences and posi-

tionality. Therefore, with concern to credibility, "as closely as possible" is the operational

phrase.

      I addressed credibility in this study in several ways. With regard to my presence altering

the research environment, I alleviated some of that effect by taking advantage of my role as a

participant observer. I, therefore, actively participated in the classroom prior to the set observa-

tion time. This was in hopes that students and teacher would adjust to and become more comfort-

able with my presence during the actual data collection period. Also, because this was a case

study focused on a population that has been frequently misrepresented and mis-portrayed in em-

pirical work, it was even more important that I accurately grasped the meaning of the teacher's

narratives, the classroom practices, and the school's curriculum. Thus, I analyzed my data con-

stantly and returned to the teacher with questions, elaborations or clarifications. I also shared my

final narratives with the teacher as a form of member checking. Additionally, the ample amount of time I was in the study context served as a way to ensure that the resulting data was thorough, reflective of the teacher's pedagogical practices, and reflective of her perspective on all matters being recorded (Merriam & Tisdell, 2016).

I also addressed credibility by utilizing multiple sources of data to crystalize my findings (Richardson & St. Pierre, 2005). I compared observation data with the data taken from the teacher interviews. The teacher interviews were also connected to the African-centered educational philosophy. The product, thus, was research findings grounded in different forms of data collection methods.

Dependability. Dependability addresses whether a study will yield the same results if replicated by another researcher (Merriam & Tisdell, 2016; Yin, 2016). However, in qualitative research, exact replication is unlikely—in that people, experiences and environments are dynamic. Expectations of similarity in qualitative study results is, thus, counterintuitive to the very idea of qualitative research (Merriam & Tisdell, 2016; Wolcott, 2005). Thus, in qualitative research, dependability is better utilized as a gauge for whether the results of a study are reflective of and consistent with the data collected (Lincoln & Guba, 1985; Merriam & Tisdell, 2016). Merriam and Tisdell (2016) suggested using the same strategies required for credibility in establishing dependability and consistency (i.e. reflexivity, crystallization, member checking). They also suggested, as does Yin (2016), that the researcher keep an organized trail of research procedures and be explicit with data collection and data analysis procedures. I abided by these suggestions in ensuring dependability for this study. Further elaboration on how I collected, organized, and analyzed data are discussed in previous sections on data collection, data organization and data analysis.

Transferability. Transferability, refers to whether the findings of this study can be generalized to operate effectively in another setting or situation. In case studies, however, the idea of generalizing is more in the theoretical sense than in the analytical sense (Yin, 2012). Transferability in qualitative research does not measure the specific transfer of findings into another setting; rather, it points to the theoretical nuggets that may suggest some predictability for other situations that share the same characteristics as the study (Yin, 2014, 2016). As a way of cultivating transferability in qualitative research, Merriam and Tisdell (2016) suggested that the researcher have "a highly descriptive, detailed presentation of the setting and in particular, the findings of a study" (p. 257). Due to the ambition to utilize African-centered pedagogical practices as an example for others in the traditional educational setting, this study was particularly concerned with transferability. I fostered theoretical transferability in this study by giving rich, thick descriptions of all processes and findings.

Trustworthiness. Trustworthiness encompasses the researcher's integrity (Merriam & Tisdell, 2016). Because trustworthiness is necessary in all aspects of the research process, its requirements are addressed across all other measures of validity. Nonetheless, to reemphasize, I established trustworthiness in this study by providing in depth descriptions of all methods and findings, and being transparent with regard to how I arrived at my findings. I also make apparent my positionality and my goal to be an agent of empowerment for the Black community. My reflexivity as a researcher preceded all interpretations. The research community can trust that the methods of my data collection, analysis, and findings are sound (further expounded on throughout the data collection section). The African American community, the African-centered school where the study was conducted, and the teacher participant can trust that they are not misrepresented or embedded into a story that is not their own.

Ethical Considerations

The design of this study adhered to the standards for ethical treatment of human participants in research, and was submitted to the Internal Review Board (IRB) of Georgia State University for approval. The participant was briefed and given an informed consent form before participation. The teacher's identity and the name of the school were anonymized to preserve confidentiality; all documents containing identification, as well as the final write-up of the study's results, also used pseudonyms. All data will be shredded after the allotted time frame the IRB recommends they be kept. Apart from the incentive of being instrumental in the strengthening of educational practices for African American students, neither the teacher participant, the school administrators, nor any others involved in this study were rewarded for participating in this study.

Summary

In this chapter, I discussed the Afrocentric theoretical framework which guided this study, and provided information on the case study methodology. I also discussed the observation and interviewing processes that encompassed my data collection methods. I introduced the participant, Auntie Eneola, and the African-centered educational context in which this study took place. I further described in detail my data analysis process, which utilized the Qualitative Content Analysis method. Verification measures that pertained to this study, as well as the processes for data management and data reporting can also be found in this chapter. The findings of this study are presented in chapter four.

4 FINDINGS

This qualitative case study examined the practices of an elementary education science teacher in an African-centered school, and how she translated the African-centered curriculum into effective instructional methods during science instruction. This study also explored the ways in which African American students' socio-political identity is recognized during science instruction in the African-centered school. With the intention of making transparent the thought process involved in translating a culturally relevant educational philosophy into practice this study further inquired from the teacher the rationale behind her pedagogical choices. Utilizing the qualitative case study methodology, the research questions for this study were as follows:

1. How do the ideals in an African-centered science curriculum manifest in the pedagogical practices of a science teacher in an African-centered school?

2. How does a teacher in an African-centered school address the socio-political aspects of the African American identity in her pedagogical practices during science instruction?

3. What is the teacher's perspective on her pedagogical choices in transferring the African-centered curriculum into practice during science instruction?

This chapter presents the findings of this study. It is necessary to mention here that although the Asempa school did have a specific African-centered supplement to their science curriculum, this curriculum was also part of a consultation package offered by the Asempa school. Thus, while Auntie Eneola abided by all the ideals undergirding the curriculum, she did not specifically utilize the school's African-centered science curriculum in the duration of the data collection period for this study due to confidentiality reasons. As is acceptable under this study's chosen method for data analysis, I induced the main themes for data analysis through the concept

driven method (see Figure 5). Thus, I utilized the Afrocentric framework, which undergirds the African-centered educational philosophy—and also undergirded the Asempa school curriculum.

In order to address all three research questions in a coherent manner, the findings are organized by the three tenets of Afrocentric educational thought: centrism, critical analysis and consciousness. Under each tenet, I present the ways in which the tenet was found to manifest in the science classroom, how the teacher recognized this tenet during instruction (with specific attention to students' cultural identity), and the teacher's perspective of her practices, as shared during subsequent interviews.

Centrism

From the Afrocentric perspective, it is theoretically impossible for one to prioritize any student in a way that is not superficial, without allowing the ideals of centrism to permeate one's thinking and one's actions (Asante1988, 1992; Hilliard, 1995; King, 2015; King and Swartz, 2014). In an African-centered educational institution, therefore, evidence of centrism was a logical expectation. A pleasant surprise, however, was the level to which—and the many more ways in which—centrism could be honored in a science classroom.

Firstly, upon walking into the study context, it was immediately apparent that here, centrism was not a blocked idea that existed within subjects, but a mode of existence that was operant prior to, and regardless of, the subject matter at hand. This began with the school environment itself. Students, parents and teachers often dressed in African-print wear that evidenced their pride and their affiliation with the continent. Wearing one's hair in its natural texture—a choice that is sometimes perceived as "brave" in the larger society due to the many negative connotations affiliated with African textured hair—was the norm in this environment. Classes in Af-

rican dance and rhythmic sounds from Djembe drums infused the hallways with a level of excitement as students went to and from their classes wearing their dance attire or carrying their musical instruments. Teachers referred to students as watoto ("children" in Swahili) as students referred to their female teachers as Mama or Auntie, and their male teachers as Baba. The respect for students, a sense of how much they were valued, was palpable, in the way adults spoke to children. Compared to my own experience as a teacher in traditional schools, Black students in this setting encountered less directive commands and seemed to enjoy more conversation and discussion with the adults around them. From my outside perspective, students' personalities seemed brighter in some sense, as though they were at home in this environment, as one would be around family.

In this way, the idea of centrism in this context was not only in connection with immediate instruction (i.e. specifically planning on ways to present a certain topic in a centered way). Inside Auntie Eneola's science classroom, one could tell even from the arrangement of the furniture, that there was a prioritization of the students' level of comfort and peace in this learning space. The desks were arranged in a laxed manner that suggested that some form of group seating had been the initial intention, but that somehow, overtime, the groups had evolved into a loose collection due to student preference. In spite of my now naïve expectation that students would want to be grouped at all times, one student had chosen to move his desk toward the back of the classroom, far removed from the group, because he concentrated better when he was sitting by himself. Another student sat a few feet away from him and the group, also by preference, for a reason that was not articulated. The rest of the class had the liberty of doing the same but had evidently chosen to remain in a loose semi-circular pattern facing the teacher. Although they remained seated for the most part, students would sometimes forego the desks altogether; on one

occasion one student participated in the lesson while sleeping on a blanket on the floor, because her head hurt every time she sneezed. On another occasion, one student jumped rope with a string meant for completing a group project, the entirety of the time it took for Auntie Eneola to introduce the project to the class. In all these instances, the students were not reprimanded by Auntie Eneola to get back in the posture of a serious student. Rather, Auntie Eneola allowed the students to move—or lie down—as they pleased, as they engaged with the lesson at hand. Even more important to mention here, was the lack of any reaction from the other students that would have indicated that these occurrence, this freedom to move around and be detached from the classroom structure, was outside of their usual norm.

The freedom to move also came in other forms. On several occasions, while drumming was in session down the hall, loud rhythms from Djembe drums could be heard during science instruction. The students would bob their heads vigorously to the music, and once, one student broke into a full-out dance in his seat. While an outsider would have been distracted by this or found humor in the spectacle of students taking a dance break in the middle of a science lesson, Auntie Eneola (and the other students) seemed completely unphased, carrying on as usual. It became obvious, quite quickly, that this practice, where students could be a little distracted by music, was standard, and that this form of distraction was not perceived as disrespectful, but as an uneventful need for these students to be themselves. When asked about this classroom atmosphere, Auntie Eneola stated the following:

> Yeah, so what's funny is that, before, I wasn't like that. Because I remember being younger in school, people got up and it's annoying. But I also remember sitting there and sitting there and sitting there. Because all of middle school we didn't have a block schedule but we had social studies and science for an hour and we opened the book and never

got up. And in high school we had experiments but we still had stations and were not allowed to move. I know our children, particularly children of African-descent, we are very rhythmic, and we remember better when we get to use that. That is one of our multiple intelligences—kinesthetic. We have to be haptic and kinesthetic, and I think we can remember better when we get to use those body parts, and we remember better when we have our juices flowing. Having a child that has an impulse problem and is on the spectrum—to have him sit in a seat would be impossible. That's being practical about it. And other students that have attention span deficiencies—having them sit down for the whole period wouldn't even suffice. So it was purposeful in how I had them move, so that I am hitting everybody and satisfying everybody who has a need to get up and stretch their legs (Auntie Eneola, personal communication, October 16, 2018).

Also just as present was evidence of centrism that pertained to students' liberty to utilize their natural mode of relating and communicating with others. Inside the science classroom, students were often talkative, interjecting with thoughts or ideas as the teacher spoke about the topic at hand, often sparking a discussion amongst themselves. They talked while they were completing their work and talked when their work was completed. When it was not necessary that they keep their eyes only on their assignment, they looked on their classmates' assignment, asking questions or telling each other what they were doing incorrectly— sometimes very loudly, and many times, although decidedly well-meaning, with little tact.

It is within this already established atmosphere that science instruction took place. The science curriculum was very much like that of traditional elementary schools. In fact, Auntie Eneola utilized a science curriculum called Science A-Z, an available online resource that inte-

grates reading with scientific content. This resource was not African-centered in any way. Neither were, in and of themselves, the science content students were to master. In the duration of this study, for example, students in upper elementary learned about the solar system, the stars, constellations, and the different forms energy. Students in lower grades learned about the weather, and the water cycle. These were not different from the standards for their fellow students in other educational settings. What I observed, thus, was a teaching of general scientific concepts—but in an inclusive, centered manner that acknowledged the Black identity, both in the process through which students gained new knowledge and in the understanding of the concepts being taught.

For Auntie Eneola's upper elementary students, the unit on the solar system began with her constructing a KWL chart to informally assess what students knew (K) about the solar system and what they wanted to know about solar system (W). Immediately after, she led the students in building a model of the solar system and simulating the orbit of planets around the sun. The task involved drawing the sun on the classroom floor with chalk. A rope was then used to calculate and simulate the distances of several planets from the sun. Students then offered predictions about how many feet it would take for each planet to orbit the sun, if given a specific distance away. They recorded this on a recording sheet provided to them.

As already stated, on paper this was a hands-on science lesson like many others. The difference, however, was in the way in which students engaged in the lesson, how they communicated their ideas about the lesson, and how they navigated the space in which they were learning. Science, here, was not quiet, or individualized, or focused in the traditional sense. Instead, much of the process was collaborative, student-centered, and, quite noticeably, with little teacher domination. For example, for the project on modeling the solar orbit, Auntie Eneola had obviously

planned for the lesson because she had sent me the lesson plans. She had also previously realized that the size of their science classroom could not accommodate the space she needed to correctly simulate the distances. Thus, for the next class she had decided on a friendly confiscation of the much bigger room across the hall, asking the teacher to exchange rooms for the duration of their simulation. She, therefore, had all the materials needed for this project.

Yet, here, during the lesson, it seemed as if she was the one learning from the students. She asked questions, took suggestions, and humbly followed instructions from students as to how to best draw the circle, where to place the sun, how long the string should be, how to best measure the string, whose feet would more accurately reflect the true measurement of a "foot", and so on. Prior to the chosen student walking the orbit, students were to predict how many feet they thought each planet would take to orbit the sun from their given distance. As the student walked, the group looked on and discussed what they believed the answer would be—a good amount of the discussion having to do with students correcting each other or telling each other to think more logically and sensibly about the process. The students then noisily compared their estimated answers to the actual answer. When asked about this process and how she would respond to outsiders who would assume that students' grades would be affected due to the excessive talking and the perceived lack of focus, Auntie Eneola responded:

> Yeah, actually in my opinion I think that they don't zone out, you know. They were engaged. So while they were moving, I allowed them to get up, but at the same time they actually perform better. When we gave tests, they performed better. The times when they didn't is when I had missed those days and I wasn't there teaching. But they actually perform better. Even children come to me this year and say 'I want you to teach science again', you know. They are getting to go [to an outdoor science program], but they're

like, 'oh I want you to teach science'…because they were allowed to move, and I don't know if they are allowed move the way that I allowed them to (Auntie Eneola, personal communication, October 16, 2018).

In this sense, Auntie Eneola took opportunities to utilize a centered framework, allowing her students to interact in this learning atmosphere as they would naturally interact at home. On one occasion, as one student shared his research on the earth's rotation, Auntie Eneola recognized from the other students' questions and comments that they were still having an issue differentiating between the words rotate and revolve. She immediately had all her students stand up and model the rotation and revolution of earth. The students stood up in a circle—as the sun. Another student, playing the earth, rotated as she revolved around them.

Although she mentioned many times the lack of resources, Auntie Eneola's science lessons were mostly hands-on—the cost of the materials financed on her own. "Hands on, they'll get it," she later stated (Auntie Eneola, personal communication, April 17, 2018). Asked if she believed without being so hands on, students would be as engaged, she shook her head. "Nope", was her simple response. "Nope" (Auntie Eneola, personal communication, April 17, 2018).

Asked about the thought process behind her methods, Auntie Eneola elaborated:

Hands on, inquiry-based science is how students really learn. In elementary school we had the book. I don't remember doing too many experiments. One experiment—can the boiled egg fit into the bottle—that was the one experiment we did in elementary school. In high school, that's when I got to do the dissecting frogs and worms. And that was still far and few between. That was two. I want them to dissect frogs now. My little piece is making some silly putty, or a thermometer, or drawing—even though it's painstaking.

You see how I had to change rooms to make it work. When we can't use upstairs be-

cause...The parking lot…we try to make things work. It could be better if we had all

things at our disposal. But even given that, they still retain. They still learn, though, and

they still aspire to do more, and they make connections making models and things like

that. So it's simple things like that because hands on, they'll get it. Project based they'll

get it. Then I pick their brains to find out what would happen if I did this, what will hap-

pen if I did that. And that's what we were doing, you know. It's painstaking, challenging.

But I wasn't focusing on, they have to get this standard, they have to get this subject.

Even though they were going to get it, it was a lot more fun for me, and more fun for

them (Auntie Eneola, personal communication, April 17, 2018).

It was also the concept of centrism that added meaning to the general science standards

students were learning. During the unit on the solar system Auntie Eneola had students continue

broaden their knowledge through research. Their curricular resource, as could be expected, did

not include any names of African-descent. However, students researched African Americans

such as Benjamin Bannekar, and William M. Jackson, who are noted for their contributions to

studies of the solar system. Auntie Eneola posed a question to students prior to their research as-

signment: "Benjamin Bannekar, William M. Jackson. Who are they?" She discussed with stu-

dents, briefly, that Black people, just like themselves, have contributed to the understanding of

complex scientific ideas such as that of the solar system. "We are not doing this for a grade," she

added. "These are your ancestors."

During our conversations, Auntie Eneola shared the intentionality behind her decision to

incorporate a research project, as well the rationale behind her biographical choices. One reason

concerned the hands-on, student-driven aspect of personal research.

The project's research where they had to find more information about a topic I had three or four computers that work. And the books, they got to rotate. and some of them used the board. And they learn because they were doing their own research. Imagine me standing up there having a lecture base, telling them this is what it is, and having them write down definitions. It's boring, and it's just like, I'm not gonna do that to them. I don't want to participate in that. I have to make it as hands on as possible (Auntie Eneola, personal communication, April 17, 2018).

Concerning her biographical choices, Auntie Eneola stated:

Having people that we look up to that are alive – that is important too. So the younger students can learn about Dr. Denise Richardson...she's still alive, she's like 52. And Dr. William M. Jackson is still alive as well, in his 80s. Having that current influence, that also makes an impact (Auntie Eneola, personal communication, February 20, 2018).

During a study of constellations, Auntie Eneola, after covering constellations as presented in their book, dedicated time to the importance of perspective. She discussed constellations in African culture, sharing with students interesting information about the Xhosa of South Africa and their belief that what the western world refers to as the milky way was to them ashes thrown up by an angry daughter. She shared other perspectives and folklore from Southern African culture, such as their belief that the sun is the armpit of a man: when he raises his hand, it shines and when he put his hand down, it dies (i.e. it sets). She also shared with her students stories about the Dogons of West Africa and their prior knowledge of the Sirius A and Sirius B system. The students voiced their own surprise when Auntie Eneola concluded that the Dogons had attributed their knowledge and wisdom to visitations by aliens or mermaidish beings. She then shared more West African wisdom regarding constellations, including some discussion of the

Adinkra symbols of the Ashantis of Ghana. Students interjected with their own knowledge.

Asked about this practice Auntie Eneola noted the importance of including multiple perspectives

in her instruction.

> It's about being inclusive. African people on the continent are related to us – that's where
> we come from, being a part of the diaspora. Even making that clear [that] there are Afri-
> can people everywhere in the whole entire world and they all had contributions is im-
> portant. Even our indigenous – we try not to say Indian – we say Native or indigenous
> brothers and sisters - also had contributions (Auntie Eneola, personal communication,
> February 20, 2018).

Thus, it was not just about recognizing the African perspective. The importance of break-

ing hegemonic educational practices also meant including perspectives that are just as marginal-

ized by Eurocentric ideals. Auntie Eneola, for example, spent a day focused on the Native Amer-

ican perspective on constellations. Beginning the class with a true or false exercise on Native

Americans, she posed questions such as "who are they", "where are they from" and "what is their

historical narrative". She gave students a sheet with Native American constellations, and shared

with them that prior to contact with Europeans, Native Americans also regarded constellations.

Going through the visuals, she shared with students what the Native Americans called each con-

stellation, and why. The Native Americans' Pathway of the Spirits, for example, was what the

Greeks called the Milky Way. Auntie Eneola then discussed with her students the similarities in

how people of long ago felt the need to make sense of the world through mythology. "Constella-

tions were a way of making sense of the world. The Native Americans did, and the Greeks did.

But we usually only hear about the Greeks!" she noted to the students. "Why do you think that

is?" The students contributed their own reasons as to why this is so. Ultimately, and very

quickly, however, the conversation drifted, settling on the similarities in the Greek perspective and the Native American perspective—such as how the galaxy was viewed as some form of a pathway by both cultures, and how both cultures identified a sibling relationship between the Seminole Brothers (Gemini twins in the Greek).

Critical Analysis

One of Auntie Eneola's favorite questions were "Why do you think that is". It was always that question and others like it that would spark a conversation about what was considered truth, what students believed to be truth, what was actual truth, and what students needed to question. During a reporting session where students shared with the class what they had discovered during their personal research on constellations, one student shared that in 1922, 48 constellations lit up the sky. The student shared that there were some ancient ones discovered by a Greek astronomer. Auntie Eneola then asked for their opinion about whether the Greek constellations would be relevant to Greek culture or if it would be universal. She shared with class that Africans discovered constellations, too. She then told students to consider what is being left out of the research they come across. "Not that the research is wrong, but there's a whole lot more they don't tell you," she said to the students. During an interview, Auntie Eneola voiced her position on the matter:

> It's controlling the population before [people of African-descent] overtake or become aware of the power that they actually have. Because how are you supposed to dominate them if they know. There is all this history that's missing and they take it out on purpose. Even in the United States history. And you know, I have had grown people come up to me and they have discussions, talking about, 'well I don't believe that we came here on a slave ship, well in my books...' And I'm just like, well this can't be. We got over here

some kind of way and we have to acknowledge that. So, it's little things like that that

bother me and we have to change (Auntie Eneola, personal communication, October 16,

2018).

Many times, as the conversations proceeded, the discussions would veer off the linear

topic of science, into a more general arena where some misconception had originated. In many

cases, it was also the other way around, where discussions on perspective and relevance would

often lead to controversial topics, that, as found in the research, many in traditional settings feel

are too political and are unequipped to address. For example, while discussing the African per-

spective on constellations, Auntie Eneola shared her findings on her research about ancient

Egyptian perspective on constellations. One student became visibly excited at the mention of

Egyptians—not because it was directly related to constellations, but because he had heard that

Egypt is not part of Africa. Sparking the interest of other students, many of who proceeded to de-

bate the matter, the conversation then turned to a discussion of the true identity of Egyptians—

are they Africans, or are they not?

Auntie Eneola shared her perspective that Egypt is in African and they are part of the

continent. She shared other perspectives on the matter but assured them that it is part of the Afri-

can continent. My own thoughts during these discussions centered on how Auntie Eneola

broached such discussions. She was not hateful or oppositional when presenting "truth" to stu-

dents—reminiscent of her statement that it was her job to give students information and their job

to then assess this information. Asking her to elaborate on this process, she stated:

You don't wanna put your own spin on it or put your own opinion on it because then

you're not letting them become critical thinkers about a situation. Put in what you learned

and then let them come up with their own ideas. When I told them about Flint…I actually

told the students…I said these are the actual facts...so I mentioned that to the students and said what do you think about that? And they're like, well why would they do such a thing? And I said well look at the population of Flint. So now why do you think that would happen? And it took so long for [the government] to do anything about it. You have the whole water source that is being poisoned, you know, this doesn't make sense. We have a high tolerance for black pain, that's what I see. That's my opinion of it. Our suffering doesn't mean anything. But, um, I didn't tell [the students] that part. I just said, so what do you think about that? What does that mean? (Auntie Eneola, personal communication, March 22, 2018).

Auntie Eneola further elaborated that there are many venues to critical analysis—where students can be forced to look more analytically at situations that are important to their communities but are superficially reported by the media. Regarding a discussion on the water crisis in Flint, Michigan with her lower elementary students, I asked Auntie Eneola how such conversations happen. She stated:

…this time we were talking about Eco systems. We were talking about how we depend on each other to provide resources. Like we depend on water, this abiotic source for our living. So, what happens when that is tainted. What do we do? So thinking about that— well, you can boil it. But if you boil it there is still bacteria, still things in the water boiling can miss. And even with lead poisoning, it takes a longer time for that to show up. So, it's those types of things that come up (Auntie Eneola, personal communication, February 20, 2018).

Just like with the ideal of centrism, Auntie Eneola reiterated the importance of staying current and the opportunity science gives in allowing students to not only connect to things of the past, but the present as well. She stated:

> And also make it current. Like now they're trying to dig in the [earth's] mantle. What does that mean for us? They're digging all the way, trying to reach the outer core. What does that mean for us? What do you think would happen if that were to happen? There is reason why we have this layer and how its compacted. So what do you think about that. We're trying to push them to start thinking about these things more critically. And it's scary, you know. One of my students, I think he has OCD, I think he was extra scared. You know just talking about the mantle getting dug into, he tried to hide under the table. He was like, 'what is gonna happen?' I said, I don't know. I'm asking you what do you think is gonna happen? If you know that the mantle is actually the thickest part, and it protects us from the outer core and the inner core, why are they digging in it? You know, I'm all for exploration, but why do you think, why is that important right now? So you just try to probe their minds to see where they are and to see what they think about things (Auntie Eneola, personal communication, February 20, 2018),

It was, therefore, in these ways that one could find critical analysis in the elementary science classroom. As previously stated in chapter one, the Afrocentric aspect of critical analysis in the education of students of African-descent also has the purpose of tackling the problem of inaccurate portrayals of truth and knowledge—most of these inaccuracies systemically curated to deemphasize societal injustices, discredit non-Eurocentric perspectives on knowledge, or keep marginalized groups marginalized (Asante, 2003; Karenga, 2003). Auntie Eneola stated the im-

portance of infusing historical accuracies concerning the Black experience in America and else-where. For her, it was not just about her duty to the Afrocentric goal of the school or the African-centered curriculum. Some of her drive came from her experiences with people of African-descent outside of the school setting. Recounting one such experience, she shared a conversation with a young lady who had fallen prey to the miseducation in traditional schooling.

> She said the slaves volunteered, they got on the boat, and that was it...And she was 23? 24? I said, Baby, that is not what happened. She said 'yes, and they had bathrooms'. I said no, we were chained on top of each other. Having to do that or say that to an older person in their early 20s lets me know that it's not being taught at all. So, it's either being left out completely, or misinformation. Because in my book in high school, it said slaves helped plant crops. Imagine it saying that...helped plant crops! It said the Native Americans actually volunteered to walk the Trail of Tears. So there are stuff that are being mis-construed (Auntie Eneola, personal communication, February 20, 2018).

In addition to the need for a correction of inaccuracies, Auntie Eneola further emphasized the inclusiveness of the African-centered educational philosophy, and the need to allow students to be a part of the critical analysis process so they will not have to bear the consequences of being miseducated. She stated:

> We have a school that says okay, we're gonna give you the facts. We're not going to de-monize any Caucasian adventures... we wanna teach them about that too. But also give the alternative of a different perspective of history…with that I really feel empowered in that I am not going to add to these black boys being statistics. Because they know who they are, they won't repeat a lot of the stuff that's going on, you know... (Auntie Eneola, personal communication, February 20, 2018).

Curious about Auntie Eneola's perspective on the idea that elementary-aged students are too young for socio-political topics, I asked her about this notion. She stated:

So then what are you doing? Instead of telling them how awesome Benjamin Bannekar was. Not just saying he invented the clock, no. Let's really think about what Benjamin Bannekar did. He helped measure time. No, he measured time. He actually measured time. Like literally. The first clock. So when you say you can't touch cultural relevance, then really, you're saying you can't touch them. You're saying they're not important, and you're going to push this and this is what it is supposed to look like…but [students of African-descent] don't see themselves in that. It doesn't make any sense (Auntie Eneola, personal communication, October 16, 2018).

She further added:

They can make their mark on society, and be as positive as possible, and learn from the mistakes of elders and young people, too. Especially in the field of science. I wasn't a math and science person at all, but being a teacher here kind of reinforced the need for that—for our children to be in those fields. I was listening to a TED Talk, and a Black woman engineer working for one of the largest engineering companies in the United States came and said 'you don't see us in this field'. And that's why you have to tell your children and inform your students. You have to push that math and science for the kids to know that they are a math and science people too. And that not just one race can own it, like they're smarter than us and we're not. And before the start of Tuskegee, the Black farmers that were working the land taught themselves math. You know, they were doing the work but they were having class while they were doing that. So we've always had to do things under the radar to actually get it done. So I'm saying there needs to be a move

to say, 'oh I know [math and science]. This is me'. And if a whole lot of us are saying 'this is me, I'm unapologetically this', then who's gonna stop us? So it's up to the children that we're teaching. We have too many 'let's fit in.' It's enough of fitting in. Let's stand out and make a difference (Auntie Eneola, personal communication, October 16, 2018).

Consciousness

Consciousness and critical analysis went hand in hand in Auntie Eneola's classroom. Many instances of critical analysis also gave students an opportunity for consciousness concerning who they are as children of African-descent, their place in society, their connection with others, and their connection with the earth. An example of this could be found during Auntie Eneola's unit on weather with her lower elementary class, which consisted of kindergarten through second grade students. The lesson began with the students dancing to a water cycle music video "to allow them to get the energy out" (Auntie Eneola, personal communication, March 22, 2018). They were then introduced to Dr. Robinson, a living meteorologist of African-descent. They then settled down to review everything they had learned about weather so far. As students excitedly shared what they knew or had learned recently, Auntie Eneola led them through the water cycle (i.e. condensation, evaporation, precipitation, collection). She at one point reminded the students that "water gets recycled; it never dies. So, it is important that we preserve our earth. As African people, we honor the earth and so we already know this is true" (Auntie Eneola, personal communication, March, 22, 2018). She later elaborated during our conversations:

We don't commit to a specific tradition but along with African culture and other people's culture, we tie their spirituality into it. So, we talk about Native Americans, and their view. You know, like we talk about weather— one of the standards I have to go over is

how Natives Americans have certain folktales and myths that go along with why some-
thing happens in the atmosphere. So that ties into it—as far as, just teaching cultures. So,
you know, we talk about the life cycle or the Eco system, and we talk about the swamps.
In Nigeria, and in Togo, and in Benin, they have a certain deity that they worship, and
earth deity that deals with keeping the Earth in balance. So we know it's purposeful to be
teaching about the spiritual culture in these cultures (Auntie Eneola, personal communi-
cation, March, 22, 2018).

Auntie Eneola and her students then proceeded to simulate the water cycle with ice, a
bottle and a jar of water. The children then created their own picture depicting the water cycle,
using cut outs for rain, bodies of water, the sun the clouds, and arrows to show direction. Auntie
Eneola explained her use of simple discussions during such units to lead even younger elemen-
tary students to access a consciousness about how things and people should be treated, so they
know when they and others like them are being shortchanged. She further spoke on the value of
incorporating what students are already being exposed to in the media.

We have to respond to the media. So that's another thing that I'm trying to do. Asking
questions like what do we need to accrue... what do we need to survive? Because right
now, you know, we are depleting our resources, we are polluting a lot. So what do we
need to do in order to stop that? You know scientist are looking for other life on other
planets.... but what about for us? The earth is something that we can't just let go. So,
what's gonna happen? Scary but I tell them, it's something that you guys coming, the
younger generation, are going to have to solve (Auntie Eneola, personal communication,
February 20, 2018).

Consciousness also meant students' awareness of the politicization of science. For Auntie Eneola, many of her actions, including her avid recognition of scientists of African-descent, was an effort at building consciousness in students.

I do pull in those ancestors so that I can let them know that, hey, you can do this too. Science is not some White man in some lab coat. It's Black women and Black men. That is the reason why we have open heart surgery and blood banks; it's because of our ancestors. And that's very important. They discovered something, why can't you? That's one of the things I would love to push in public school. That misconception that science looks one way and that we're not making any type of strides. It's not true. Ours is just hidden big time. So I'm not going to strive to be this white scientist. And even in the sense of Africa as a continent. Africans have made strides and they're making strides today (Auntie Eneola, personal communication, April 17, 2018).

Likewise, consciousness also came in the form of helping students develop a conceptualization of Africans and the African continent that is different from societal portrayals. Auntie Eneola further elaborated:

I know when I was in elementary school I was called African booty scratcher. African people live in huts, blah blah blah. But here you won't get that. You say you are from Africa, you are from Ghana, then its oh, what do they do over there? It's excitement. I'm not saying there aren't other parts of the world that need help, that's not what I'm saying. What I'm saying is there's a lot more information out there. My friends are excellent. The African people I know are doctors, scientists…and I wish I was in their tax bracket, but I'm nowhere near. My friend did a study on this—there is greatness everywhere. Especially in our own people. We talk about what's going on in Nigeria and the oil reserves—

how do they maintain that? How do they make sure they're not polluting, and where does all the money go? Things like that. How do we prevent another oil spill? Those are the things we talk about. Real world issues; pulling things that have been hidden and discussing them, especially about us. And I'm not saying it is all about us, because we talk about Asians, we talk about indigenous people. But we know that we [people of African-descent] are not going to get any type of recognition at all unless we pull it to the forefront (Auntie Eneola, personal communication, April 17, 2018).

Consciousness in the science classroom, however, did not always come directly attached to scientific topics, although often related. During the unit on constellations, for example, students created their favorite constellations using jujubes and toothpicks. Unlike many traditional settings where students could consume their edible creations after the lesson, Auntie Eneola's students could not. This was because they and others in this school could not be fed anything containing artificial dyes due to their ill effects on the human body—such as hyperactivity and behavioral issues in children. The students already had knowledge of the why of this rule, and so did not fight it. As probably is often the case, one students inquired whether they could eat their jujubes; Auntie Eneola took the opportunity to explain why they could not. They were allowed, however, to take their constellations with them off campus.

In this way, Auntie Eneola took every opportunity to build a sense of consciousness within her students. Once, in an effort to show a Magic School Bus movie on the differences between rotating and revolving, one of the upper elementary students became extremely disruptive. There then ensued a shouting match between this student and another student who became very irritated with his disruptive behavior. Auntie Eneola decided to no longer show the movie. Instead she sat down, quieted all the students, and calmly asked them the meaning of their school's

name and motto. She then, forsaking the topic of the solar system altogether, described the situation of slavery, and how escaped slaves had to create a safe space in which they could freely exist. She then added the importance of all students feeling safe in their classroom space. She finally addressed the outbursts, telling the students the need to deescalate situations by not responding to other students' momentary inability to uplift their commitment to their learning community.

Concerning incidents like these, Auntie Eneola later stated her foremost task of ensuring students' consciousness of the important principles of African people: "Helping each other, it takes a village, this person is not separate from me. We're very communal. We don't come from this very individualized place" (Auntie Eneola, personal communication, February 15, 2018).

Asked, then how one can incorporate consciousness into the elementary science classroom, Auntie Eneola elaborated:

> What did they want to know? The students. Start with them. Where are they at? What's the population? Start with their interest, and then what's around them. I know our class talks about the CDC [and] what it does specifically. So we think about that. How many people that look like you do you think work there? Just pick their brain to see what they think. Then okay, you go back to analyzing and you see that they don't think that we [people of African-descent] do anything. That'll get you starting from a base where they have no context. Just start from them, I would say. What do you think we need? What do you see in your community? Like a survey, or something. What do you need to make your lives even easier. Something like that. Because based on what they say, then you can shape what you can incorporate. Because it's really important to know how the student feels (Auntie Eneola, personal communication, April 17, 2018).

About her own consciousness as an educator, Auntie Eneola acknowledged the unending quest to always improve and added: "That's my thing. It gives me chills because I'm so passionate about it, and there's so much that I would like to know. I really just need to go back to school. I'm working on it" (Auntie Eneola, personal communication, February 20, 2018).

Summary

In this chapter, I presented the findings of my observations and my conversations with Auntie Eneola, categorized around the three themes of the African-centered educational philosophy—centrism, critical analysis, and consciousness. As a participant observer, I was part of this space in any capacity Auntie Eneola asked me to serve—which was often as an aid during experiments and small group work. The experience was an eye-opening one that held many implications for elementary science educators seeking to better their approach to a sociopolitically inclined, culturally relevant science instruction for students of African-descent. A discussion of the findings and these implications can be found in chapter five.

5 DISCUSSION

This qualitative case study examined the practices of an elementary education science teacher in an African-centered school, and how she translated the African-centered curriculum into effective instructional methods during science instruction. It sought to answer the following questions:

1. How do the ideals in an African-centered science curriculum manifest in the pedagogical practices of a science teacher in an African-centered school?

2. How does a teacher in an African-centered school address the socio-political aspects of the African American identity in her pedagogical practices during science instruction?

3. What is the teacher's perspective on her pedagogical choices in transferring the African-centered curriculum into practice during science instruction?

This study emerged from my own science experiences as a student of African-descent going through the American educational system. It also emerged from my role as an elementary education teacher and my concern for the current educational climate and its proven inadequacy in educating students of African-descent (Boykin, Tyler, & Miller, 2005; Fordham & Ogbu, 1986; Shujaa, 1993). In stating the problem, I acknowledged the efforts of Culture-based Pedagogical Theories (CBPTs) in addressing the causes of these inadequacies. I, however, also recognized the difficulties that I, and many educators, face in translating CBPTs into practice, and the frequent omission of the socio-political component of CBPTs in the classroom (Gay, 2000; Irvine, 2003; Ladson-Billings, 2005). More specifically, I further acknowledged many elementary educators'

incorrect assumption that CBPTs and their socio-political components are unnecessary or difficult to employ in the subject of science (Bryan & Atwater, 2002; Gunning & Mensah, 2011; Lietz, 2001; Wang & Marsh, 2002).

I reasoned that the African-centered curriculum, which is based on the Afrocentric educational philosophy, encompasses the components of CBPTs for students of African-descent, and is especially committed to the socio-political components of educating Black students, in all subjects (Asante, 2003; King, 2015; King & Swartz, 2014).). Thus, in researching how one elementary educator applies the African-centered educational ideals during science instruction, I, through this study, sought to reveal some practical ways in which educators in traditional educational settings may implement CBPTs during science instruction, while acknowledging the socio-political aspects so often disregarded.

 With the aforementioned premise in mind, a discussion of this study's findings, and its implications for elementary level science educators, are presented in this chapter. Responses to key educator concerns on this topic, as identified in previous research, are also addressed when applicable. This chapter then concludes with commentary on this study's contribution to educational research, and its recommendations for future research.

Research Question 1

How do the ideals in an African-centered science curriculum manifest in the pedagogical practices of a science teacher in an African-centered school?

The Asempa School was built on the same African-centered ideals that undergirded its science curriculum. Thus, the practice of these ideals (i.e. centrism, critical analysis, and consciousness) at the school-wide level preceded their manifestation in the science classroom. Observed instances of centrism, for example—such as the conversational tones of communication

between teachers and students, the African-style attire often worn by students and teachers, the wearing of one's hair in its natural texture, and African-based extracurricular activities (such as African dance and drumming)—all spoke to an atmosphere where the African-descent identity was constantly being recognized and affirmed. As such, as expressed in the findings, it was not out of the ordinary to hear the sound of djembe drumming penetrating through the walls during science instruction. It was also not out of the ordinary to find students dancing to the sounds without reprimand from the teacher—or much reaction from other students in the classroom.

There was already a mindset at the Asempa School, thus, that challenged conventional educational practices. Students' natural response to music, for example, was not treated as an infraction. Likewise, the sound of djembe drums reverberating through the building—by traditional standards a loud distraction— was not considered annoying or too loud for an educational setting. Without the imposition of Eurocentric ideologies, rhythmic African-style drumming was perfectly acceptable and enjoyable alongside intellectual activities. This adjustment in perspective about norms and acceptability—what one welcomes as "educational" or "educative" in a learning environment—seems to have made it possible for African-centered ideals to be applied to all else at the Asempa School. Many of the manifestations in Auntie Eneola's pedagogy as a science teacher were a function of this mindset, this openness to breaking old ideas about scientific behavior and practicing new ones. Although it is true that many schools do not enjoy a school-wide commitment to uplifting the identity of African-descent students, this finding firstly suggested, and confirmed, the necessity of a modified teacher mindset in being able to genuinely practice any CBPT in the classroom.

The idea of focus, for example, is one that stood out regarding teacher mindset. Previous research indicated that although students of color were evidenced to thrive in classroom environments with higher levels of communalism, movement, expressiveness, verve, and orality, students who exhibited these behaviors (i.e. dancing to rhythmic music in the middle of science class) were, by traditional standards, labeled as misbehaving, talkative or lacking focus (Boykin & Bailey, 2000; Gay, 2002; Tyler, Boykin & Walton, 2006). Auntie Eneola, however, through her willingness to break from traditional educational expectations, centered the cultural identity of her students not only by allowing students to converse and move when they felt the need to (even to the point of jumping rope during a lesson), but also by allowing structured forms of these elements whenever necessary. Her students were often able to discuss procedures and collaborate with their classmates in a set-up that often took the form of standing or roaming the room—as one would at a small gathering of some sort.

However, what could be mistaken by an outsider as chaotic, or lacking focus, often proved not be. With all the noisiness and excitement amongst the students, marks of good science (such as theorizing, collaboration, investigation, communication, and results) could still be observed. For this assignment specifically—which was a project on planetary proximity to the sun—the resulting student work proved that focus did not have to be quiet. The sheets to be graded indicated that Auntie Eneola's students were ultimately able to record their estimates, and could articulate in writing the differences between their estimates and the actual distances. Likewise, they were aware of the process it took to get to the actual answer, likely due to the collaborative (albeit explosive) manner through which they had agreed to the soundness of their method. The findings, thus, suggested elementary science educators foregoing the initial perception of this learning structure as chaotic and unproductive. It further pointed to educators beginning the

process by taking the initial risk of actually allowing students to work in such an environment, in order to reap any resulting benefits.

The findings also suggested honoring a vervistic mode of learning by incorporating hands-on experiences and reducing activities that are desk-bound. While this was not necessarily a novel finding, in that it is best practices for any science teacher at any educational level, Auntie Eneola's pedagogy went further in revealing that science instruction for students of African-descent constantly involves movement, talking, partnerships, conversations, music—at all times (i.e. before, during, and after the learning of scientific concepts). Auntie Eneola's practices suggested allowing students to manipulate these concepts through the building of models, conducting experiments, and simulating concepts beyond the textbook. This was not only the case for the upper elementary students—who experienced all these elements during their science lessons (such as making temperature changing slime during a discussion on thermal energy). It was also the case for the lower elementary students, who often started their lessons by dancing along to a music video about the day's science topic before embarking on some writing. It was most notable that Auntie Eneola consistently followed initial activities with exciting but quite simple hands-on projects—such as creating water condensation with a coke bottle and some ice, or simulating a hurricane with glitter and water, or representing the water cycle with a cut-and-paste project using colorful paper.

Important to debunk, however, is the notion that African-centered science pedagogy must be a one-dimensional endeavor. The focus on vervistic instructional methods did not mean a neglect of other necessary elements of teaching and learning. Having even younger students write and define scientific terms was, as Auntie Eneola stated, painstaking, but necessary (Auntie Eneola, personal communication, March 22, 2018). Yet, Auntie Eneola's acknowledged that without

hands-on elements in her instruction, students were much less engaged and did not retain as much. This echoed the findings of other research that indicated that cognitively demanding activities were better completed by students of African-descent when the instruction included music, communal work, and variation of task type (Bailey & Boykin, 2001). Thus, while the findings suggested that traditional modes of teaching such as book work (where students are simply exposed to theoretical ideas of scientific concepts) are not out of the question, a stronger implication pointed to teachers maximizing the value their students place on science through engagement. This aligned with a previous finding that the difference between Black students who later pursued careers in the sciences and those who decided not to was a memorable experience in a science classroom (Archer, Dewitt & Osborne, 2015).

Consciousness and Critical Analysis. The African-centered ideal of consciousness was likewise translated into the classroom through a reimagining of normal science instruction. The findings, however, revealed an intertwining quality in the manifestation of African-centered deals in the science classroom, where the practice of one often invokes the practice of another. Thus, although they hold unique labels and descriptions, centrism, consciousness and critical analysis were not always mutually exclusive in practice. This evidenced how the true and genuine practice of one ideal increases the possibility of automatically addressing the others.

For example, the constant incorporation of biographical research on notable or influential people of African-descent is a technique that, in the elementary setting would traditionally be more likely reserved for subjects such as Reading, or Social studies, or a biography project during Black History Month. However, Auntie Eneola used this technique to resolve the issue of the lack of a Black presence in the scientific arena. This addressed the ideal of centrism, in that science education for students of African-descent necessitates discussions of scientists of African-

descent. It also, though, was a manifestation of the ideal of consciousness, in that students were made aware of the presence of Black people in the scientific arena—a form of knowledge not generally present in generic or traditional textbooks. Admittedly, the science text Auntie Eneola used only focused on processes, so to speak, and did not necessarily spotlight real scientists of any race. However, it was important for Auntie Eneola to also exercise a form of consciousness as a teacher in recognizing that students of African-descent need this added aspect of biographical information, regardless of whether the textbook comprises a biographical component. Without such added efforts, she risked her students learning a hidden curriculum regarding who can be a scientist, and whether they themselves could be scientific thinkers with a potential career in the field (Archer, Dewitt & Osborne, 2015; Emdin, 2011).

Critical analysis as translated into the science classroom often accompanied that of consciousness—in that the process of consciousness often pushed students to an awareness of matters, as this awareness also pushed students to critically analyze the nature of these matters. This suggested a process where there simply needed to be on the teacher's part a willingness to introduce science-related information relevant to students, communities of African-descent, and other minoritized societal groups. For Auntie Eneola, the non-negotiable factors here were that of truth, exposure, and relevancy. She utilized conversations such as that on the water crises in Flint, Michigan to broaden students' consciousness to real issues faced by Black communities, compelling them to identify unfairness and poor actions where it existed, and viable solutions where necessary.

However, although with critical analysis there often presented itself undeniable patterns of injustice and discrimination already embedded in the American society, Auntie Eneola was

always clear in her actions and in personal conversations that the goal is "not to demonize anybody" (Auntie Eneola, personal communication, March 22, 2018), or use fiery language with the purpose of inciting anger and fury. Rather, the implication is that of sharing with students fact-based perspectives and insights not offered by their textbooks, and then facilitating discussions that allow students to deliberate and analyze this new information as it relates to them, their communities and nature. A practical manifestation of this could be found in the study of constellations where including African and Native American perspectives served not only to broaden students' understanding that science is not a European concept, but to also help students see that in some cases—such as that of constellations—other cultures' understanding of scientific matters preceded that of Europeans.

It is appropriate to mention at this juncture, however, that, as indicated by scholarship on the Afrocentric perspective, the inclusion of marginalized perspectives is not a simplistic concept, but one that is rather involved where equity is concerned. The Afrocentric critique of the traditional translations of multiple perspectives has been with teachers simply embedding hegemonic European master stories with that of other cultures, instead of deconstructing these master stories and genuinely exploring the other perspectives (Asante, 1988; King & Swartz, 2014; Nobles, 1990). A way to tackle this common problem was observed in Auntie Eneola's classroom where the prioritization of the textbook's narrow perspective was lessened by the significant amount of Auntie Eneola's students spent in studying African and Native American perspective on constellations. As she did with the Greek and Roman constellations, Auntie Eneola spent time teaching specific names of Native American and African constellations, and discussing the folktales and the mythologies surrounding these constellations. Additionally, her students were given the liberty to choose which cultural perspective to take when it was time to model, draw or

discuss the constellations during independent work—here illustrating a practical manifestation of the democratization of knowledge so often missing in traditional educational settings.

Spirituality also emerged within the intertwined relationship of African-centered ideals in practice. In being inclusive and allowing the Dogon perspective on solar matters (the Dogons claimed spiritual assistance in their accurate scientific understanding of the universe) (Griaule & Dieterlen, 1965), Auntie Eneola could automatically honor the important aspect of spirituality during science. Although Western science separates science and spirituality, Auntie Eneola's practice suggested that this does not necessarily have to be the case for science to be authentic. Thus, in being inclusive and sharing such information, students can be empowered knowing they can honor their cultural ethos of spirituality, and still become scientists in any capacity of the word.

Research Question 2

How does a teacher in an African-centered school address the socio-political aspects of the African American identity in her pedagogical practices during science instruction?

Time with Auntie Eneola revealed that socio-political science education also does not have a single appearance. As it is necessary to shed ideologies about the doing of science, so is it necessary to shed ideologies about how socio-political science must look. In the duration of this study, Auntie Eneola's students did not execute any major projects resembling the ones typically found in many research on socio-political science education (Dimick, 2012). Yet, this was not to say that socio-political science was not taking place with students at the elementary level. Rather, what emerged from the findings was that preconceived notions about socio-political science ped-agogy—fueled also by the nature of research on socio-political science education—neglect the foundational quality of elementary science education. Thus, it also neglects its role in preparing

children of marginalized populations to reason as social agents in the scientific arena. In this sense, this study's findings may have shed some light on the reason behind many educators' belief that science instruction for socio-political purposes is inappropriate for elementary students (Bryan & Atwater, 2002; Gunning & Mensah, 2011; Lietz, 2001; Wang & Marsh, 2002); without an understanding that elementary-aged students do not necessarily need to encounter the more complex tiers in socio-political understandings, such a task can be daunting for many traditional educators.

Auntie Eneola, however, was not extravagant in getting across to her young students that the politicization of science has led to a skewing of the information presented in traditional science textbooks. Her methods in addressing such topics, while quite simple, were very intentional, though, and hinged on a pedagogy of inclusiveness. This inclusive approach automatically led to discussions that were socio-political and empowering in nature. Discussing the Dogons' discovery of Sirius without Western influence, for example, was at the foundational level, a socio-political move that addressed the lack of marginalized perspectives in science. During interviews, however, Auntie Eneola touched upon the role of such conversations in also helping her young students see that people just like them had interacted with complex scientific understandings. Thus, although Auntie Eneola and her students were not involved in a community water clean-up project (Dimick, 2012), or an urban green energy experiment (Calabrese & Tan, 2010), teaching about Dogon, Native American and other sub-Saharan perspectives contributed to the continuous effort at modifying students' previously instilled notion that science is a European concept.

In this way, Auntie Eneola also addressed another element often missing in many educators' efforts at culturally relevant science pedagogy—that of power-based dynamics in science

(Codrington, 2014; Patch & Cox-Peterson, 2008; Mutegi, 2012). In her classroom, a simple question such as "if all these other cultures regarded constellations, why do we only read about the Greeks and Romans?" was often enough to spark a conversation about the subjectivity of knowledge. It also brought to light the partial nature of many traditional educational textbooks. Although this approach may seem effortless, Auntie Eneola's purposeful line of questioning suggested a need for courage and conviction on educators' part in firstly recognizing the necessity of truth in education, and then in countering hegemonic falsities by initiating such conversations.

The findings also suggested that the openness to allowing socio-political discussions during science also means that no topics are off limits, even if they are not perceived to be immediately related to science. Auntie Eneola's recognition of teachable moments, and her willingness to allow conversations to veer from the science topic at hand, made every moment a good moment to elaborate and correct troubling misconceptions. Mentioned in the findings, for example, was a moment when, while discussing Egyptian perspectives on constellations, one student brought up a rumor he had heard about Egyptians not being Africans. This is a political topic that, interestingly enough, has intrigued seasoned scholars (Diop, 1974; Kamugisha, 2003; Sanders, 1969), and may have much to do with the incompatibility between the (very scientific) accomplishments of ancient Egyptians and the perceived (in)abilities of people of African-descent (Gould, 1981; Kidd, 1904; Jensen, 1999; Madison, 1916). Although this digression was not directly related to constellations, Auntie Eneola allowed her students to continue to discuss the topic—on which, incidentally, they had much to say.

The implications of the above example are, firstly, that of teachers honoring the cyclical and all-encompassing communication pattern that is common to many cultures of color (Gay, 2002; Tyler, Boykin, Boelter, & Dillihunt, 2005; Tyler, Boykin, Miller, & Hurley, 2006).

Secondly, socio-political topics have much to do with power, politics, identity and race—themes that transcend superficial boundaries (such as educational subjects), and therefore cannot be truly compartmentalized. Thus, in Auntie Eneola's class, the lack of boundaries where socio-political topics were concerned mimicked a social truth—which is that people of African-descent, especially in the United States, must often confront socio-political issues that lack rhyme, reason or classification. A recent news headline, for example, reported a case where a Black person was targeted as a potential criminal for babysitting White children (Gomez, 2018). Another headline reported a Black man being targeted for entering his luxurious residence simply because a fellow White resident assumed he did not live there (Carrismo, 2018). Yet another case involved a Black student being targeted while resting on campus, because she did not fit the profile of a student at a highly regarded Ivy League school (Griggs, 2018). People of African-descent, thus, encounter socio-political issues while carrying out ordinary activities they do not predict will yield such consequences. Auntie Eneola's pedagogical technique suggested that teachers take on this foundational practice and demonstrate to students that socio-political issues can, and should, be addressed whenever and wherever—because, in the real world, socio-political issues often emerge out of context, and must be addressed, whenever and wherever.

Socio-political science is past and present. The findings also revealed that African-centered socio-political science is just as concerned with the present as it is with the past. One perspective in the literature criticized the Afrocentric perspective as one that lives in the past and worships fairy tales of Black feats long gone (hooks, 1995; Walker, 2001). Teachers, however, must know that there is legitimacy in focusing on the past in the attempt at socio-political science education—in that, the information found in many textbooks is a consequence of history. A

study of constellations, for example, is very much an exercise in past ideas, because the conventional names of constellations are steeped in ancient Greek and Roman mythology. Thus, when textbooks inadvertently, with seemingly little political intention, present constellations only from the Western perspective, there is a monopoly on this idea of constellations—in spite of the fact that other cultures, namely Native Americans and Africans, also recognized and regarded constellations before European contact (Miller, 1997; Griaule & Dieterlen, 1965).

The now-ness of Auntie Eneola's approach to culturally relevant science for students of African-descent, however, dispelled the notion that Afrocentricity is unconcerned with present affairs. In word and in deed, Auntie Eneola communicated the goal of teaching students that their worthiness does not only lie with their ancestors and that they have a part to play as young thinkers of African-descent. Auntie Eneola, thus, wove into scientific content and experiments important socio-political topics that ranged from the water crisis in Flint Michigan, to the maintenance of the oil reserves in Nigeria, to the prevention of oil spills and the curtailing of pollution. In this way, while Auntie Eneola and her students conducted small experiments specific to the state content standards, there was also a link to the current meaning of these standards. The implication, thus, was that of teachers' need to, again, extend the lesson beyond the text book. With this theme specifically, the findings implied elementary science educators also staying abreast of science-based socio-political issues that concern students' communities, as well as the larger population of people of African-descent around the world.

Socio-political science does not impose. The findings also revealed that socio-political science did not have to mean an imposition of the teacher's political ideas on students. Auntie Eneola, in word and in action, constantly reiterated the importance of not telling students what to think but, rather, giving them facts and allowing them to construct their own ideas. This related

to Young's (2011) finding that some teachers avoided socio-political conversations with students under the noble pretense that they were, in effect, avoiding impinging their own political notions on their students. Time with Auntie Eneola however, supported Young's response that these teachers were misunderstanding their role, not as stout changers of students' minds, but as facilitators who "invite students to question, challenge, and critique structural inequalities that exist in society" (Young, 2011, p. 255). Auntie Eneola's practices suggested utilizing questions such as "so what do you think about that" to open up a critical analysis of a certain topic. Such questions seemed to allow students to grapple with the information they were being given. It also allowed them to deliberate with other students as they shared their thoughts on the issue. Other questions utilized by Auntie Eneola included "what can we do?" and "how does that make you feel?"

Research Question 3

What is the teacher's perspective on her pedagogical choices in transferring the African-centered curriculum into practice during science instruction?

Two themes that emerged in Auntie Eneola's communications about her perspective were that of deliberateness and consciousness.

Deliberateness. When elaborating on her practices, Auntie Eneola frequently began with the phrase "I want them to", followed by her desire for her students to think a certain way, see science from a certain perspective, or experience science in a certain manner in her classroom. Although she had—and often lamented about—very limited resources, Auntie Eneola followed up on these desires by bringing in self-funded resources for hands-on experiments, as well as pictures, narratives and biographical information about notable scientists of African-descent. For the lesson on constellations, for example, Auntie Eneola brought colorful images of Native American constellations labeled with their Native American identifiers. In action and in speech, thus,

Auntie Eneola's perspective on translating the African-centered curriculum into practice involved, and suggested, a purposed mentality regarding the goals of a centered science education, and then much deliberate planning to achieve it.

It was also often apparent during interviews that because of her own passions, adhering to certain values of the African-centered approach— such as not imposing her opinions on her students—required deliberate effort on Auntie Eneola's part. When asked about her classroom conversations regarding the water crisis in Flint, Michigan, for example, Auntie Eneola's response included the following:

> We have a high tolerance for black pain, that's what I see. That's my opinion of it. Our suffering doesn't mean anything. But, um, I didn't tell [the students] that part" (Auntie Eneola, personal communication, March 22, 2018).

Not "telling the students that part" adhered to the African-centered tenet of allowing her students to arrive at their conclusions through critical analysis. However, it did not mean that Auntie Eneola had a shortage of very passionate opinions about socio-political issues concerning people of African-descent, as was often evidenced in her responses during interviews. Cautiously editing her speech and curbing the inclination to voice her opinion during instruction, thus, evidenced for Auntie Eneola a constant exercise in being deliberate as a facilitator of these topics.

Likewise, when asked whether the continuous movement in her classroom was more a function of her personality (i.e. her not being easily annoyed by movement and chattiness) or a consequence of her awareness of her students' need for movement, Auntie Eneola stated that as a student herself, she had found it annoying when fellow students would move around the class-

room. She, however, also recounted the plight of having to sit for long periods of time as a student, and then went on to explain why it was important for her to allow constant movement in her classroom:

>...I know our children, particularly children of African-descent, we are very rhythmic, and we remember better when we get to use that. That is one of our multiple intelligences—kinesthetic. We have to be haptic and kinesthetic, and I think we can remember better when we get to use those body parts, and we remember better when we have our juices flowing. Having a child that has an impulse problem and is on the spectrum—to have him sit in a seat would be impossible. That's being practical about it. And other students that have attention span deficiencies—having them sit down for the whole period wouldn't even suffice. So it was purposeful in how I had them move, so that I am hitting everybody and satisfying everybody who has a need to get up and stretch their legs (Auntie Eneola, personal communication, October 16, 2018).

Like many other educators inside and outside of the African-centered educational environment, thus, Auntie Eneola had personal preferences and personality traits that would have manifested differently in the classroom, had she not made a deliberate decision to identify with her students' needs instead of her own proclivities. This pointed to the notion that where educators are concerned, the goal of CBPTs is not necessarily to strip personal preferences. In the words of King and Swartz (2014), it is for educators to rightly "identify more with the families of their students and the communities their students will be serving than with the hierarchy above them" (p. 93).

This particular finding was surprising, in that, although it was alluded to in statements such as King and Swartz's (2014), its potential implications were not overtly highlighted in previous literature. In light of Auntie Eneola's words and actions, though, one sees how the choice to "identify more with students" is a deliberate action. It leads to the implication that while an understanding of students' educational needs must modify an educator's epistemology (and thus pedagogy), it is safe to say it does not necessarily require a change in the educator's own natural or cultural make-up. Teachers come into the classroom with their own unique ways of being, just like their students.

However, it is also to say that, in deliberately centering students and identifying with their needs, a teacher's personal preference must not be the educational death of his or her students—especially in the sciences where the stakes for Black students are high. I liken this dynamic to the following analogy: A mother loves eggs but has a child who is allergic to eggs. Most mothers would not continue to feed eggs to this child just because of their own preference for eggs— especially if they know eggs can destroy the child. In the same way, a Caucasian teacher (or a teacher of any ethnicity) may have a preference for traditional classroom practices. This must not mean a forcing of this personal preference on students who do not thrive and, proverbially, can be just as destroyed by these practices—as is evidenced in statistics of African American students in the United States.

Teacher consciousness. Teacher consciousness emerged as nonnegotiable condition to successfully executing sociopolitical, culturally relevant science pedagogy. Auntie Eneola was well-versed in many, if not all, of the tenets of African-centered pedagogy as outlined in the literature (Asante, 1988; Kershaw, 2003; Lee,1990). She was also well versed in how to approach

teaching in this manner. As a fellow educator, I as the researcher was often aware of the necessary amount of research and understanding it would take for me to become a more effective educator in this sense. I was also keenly aware of the reality that Auntie Eneola's teaching practices cannot be achieved by other educators without proactive cultivation.

The implication, thus, was that education on the part of teachers matters. As Hilliard (1995) stated, the teacher must master the African story if he or she is to do any justice in deconstructing hegemonic Eurocentric narratives. Because truth is especially important in countering the hegemonic nature of the current educational system (Hilliard, 1991; Karenga, 2003), a most significant implication was also that teachers must be proactive in doing the research it requires to 1) find the truth, and 2) reveal it to students in a meaningful way that liberates and empowers, but does not impose or demonize others. The literature on African-centered pedagogy supported this finding and reiterated many times the futile venture of an educator trying to teach in African-centered ways while he or she is lacking in information, care and understanding (Asante1988; Hillard, 1995; Lee, 1990).

Also important to note is that Auntie Eneola's had an already-existing passion for African-centered educational objectives. However, despite her passion, it was evident that her level of consciousness had been developed through her desire for constant education—as could be deduced from the following statement: "I'm so passionate about it, and there's so much that I would like to know. I really just need to go back to school..." (Auntie Eneola, personal communication, February 20, 2018). Auntie Eneola, thus, possessed an awareness that she could not simply rely on passion; she needed the practicality of further education to put her passions to work. This supported a perspective from which this study emerged: which is that for educators who realize the educational difficulties their African-descent students face, the issue is not that

they are blind to the need for change or the necessity of CBPTs (Gay, 2013; Hammond, 2015; Henfield & Washington, 2012; Ladson-Billings, 2011). Rather, the challenge is in channeling this initial acknowledgement into an existing, workable pedagogy through necessary knowledge. Thus, time with Auntie Eneola supported the notion, and suggested an overall implication, that there truly is no substitute for teacher knowledge; educators who wish to genuinely prioritize the educational needs of their African-descent students must prioritize their own need to be empowered through education (Asante, 2003; Cokely, 2003; Lee, 1990).

Addendum

Back in my own classroom, in a traditional setting with a majority African immigrant population, it was important for me to view these findings and implications from a perspective that reflects the needs of my specific population of students. The Afrocentric educational philosophy speaks to the shared identity of all students of African-descent in the United States; thus, it was in the African-centered environment that I was most likely to encounter pedagogical practices that fulfill my aim of prioritizing my students' cultural and socio-political identities in science. As such, implications such as the necessity of educators' renewed mindset regarding how science looks and sounds, and the importance of educators' own consciousness about what and who should be considered worthy scientific topics of exploration were relevant.

Likewise, because Eurocentric perspectives served to subordinate the Black race all over the world (not just in the United States), colonizing mentalities aimed to do to Africans in Africa what enslavement and oppression of civil rights aimed to do to those outside of the continent (Boahen, 1987; Cesaire, 2000; Rodney, 1972, Traore, 2004; 2006). Consciousness and critical analysis, thus, in my classroom of African immigrants, would serve the same purpose of educating, deconstructing, and gaining a critical perspective of science on the elementary level.

However, although much binds all people of African-descent culturally (and due to paral-lel encounters with European domination, socio-politically), there are unique challenges that African immigrant students such my students, face. Similar to my own experiences as an African immigrant student in the United States, research showed that African immigrant students in the United States experience even further another level of invisibility and contention in the U.S classroom due to media-induced misconceptions about Africans and the African continent (Traore, 2004; 2006). Without the corrective measures in schools that might portray Africa more accurately via a curriculum for African American students, narratives in the media depict the African continent and its inhabitants as wholly underdeveloped, uncivilized, pitiable and altogether irrelevant (Boahen, 1987; Cesaire, 2000; Rodney, 1972, Traore, 2004; 2006). Furthermore, just as in my own experience of coming from a culture that did emphasize the sciences, what I find is that my immigrant students and their parents are of diverse backgrounds, where even students from the same country may have dissimilar economic, educational, and religious experiences.

Honoring the Afrocentric idea of centricity, then, pushes me to further center my students, not just as students of African-descent, but immigrant students with unique experiences and concerns. The question for me then becomes how I can utilize my time with, and knowledge gained from, Auntie Eneola in ensuring a pedagogy that is centered, conscious and critical for my unique population of students. What are the science-based issues faced by communities of African-descent in the United States and in Africa? What are the ways in which my elementary students can utilize scientific concepts to which they are introduced to address some of these issues? While the thought can be intimidating—because one can envision the responses to these questions to be vast—it is, yet again, important to keep in mind the foundational quality of elementary science education. Thus, as suggested by the findings, the goal may not necessarily be to

undertake complex projects (although that would be a welcomed approach), but rather to focus on the foundational goal of sowing within students a mindset that conceptualizes these issues and is unafraid to critically analyze and assume some agency in addressing them.

Thus, as Auntie Eneola was deliberate in being well-informed about scientific concerns relevant to her students, so it is that I must deliberately develop a level of consciousness in order to cater to my African American students, while also keeping the specificity of the Eastern African immigrant identity in mind. I cannot, therefore, simply utilize biographies of African-descent scientists originating from U.S.; biographies must also be of scientists originating from continental Africa, and also from students' own countries. I must also enlist my students' help in identifying how the concepts being covered may relate to their communities here and abroad. As iterated by Auntie Eneola, what do my students care about? I can use the responses to such questions in cultivating within my students an intrinsic need to utilize their knowledge to better their communities through a genuine interest in science. Additionally, I can utilize the opportunity of having African immigrant students and African American students in the same space to not only instill a critical view of science, but to also to broaden the mindset of my African-American students about a continent they should be familiar with, but have little knowledge about due to the lack of its presence in the curriculum.

Contributions to educational research

This study contributes to educational research by illustrating how culture-based pedagogical theories can come to life in a real science classroom. It adds to other important work that give a glimpse into the Afrocentric or African-centered educational initiative (Piert, 2015; Shockley, 2011; Swain, 2011). This is significant, in that, as elaborated in the literature review,

the African-centered initiative is one that is often misconstrued by many who have not experienced it, and therefore is undervalued as a valuable resource for long-term educational improvements for all students of African-descent.

This study contributes also as a tool for educators looking to broaden their own consciousness regarding sociopolitically-inclined science education at the elementary level. Its major findings on how science educators can shed hegemonic ideas surrounding the subject and the learning of science, and its suggestions for more inclusive practices, add to the sparse amount of previous literature on this topic.

Also a valuable contribution is this study's implication that socio-political science education at the elementary level can be of a foundational quality. As evidenced by previous literature (Bryan & Atwater, 2002; Gunning & Mensah, 2011; Lietz, 2001; Wang & Marsh, 2002), many science educators at this level do not realize that while they can very well undertake the more complex interpretations of socio-political science education, beginning with foundational steps (as practiced by Auntie Eneola) is important and often sufficient. A major value of this study, thus, is its implication that it is better for struggling elementary science teachers to begin with this foundational goal in mind, than to altogether eliminate the socio-political idea because its more complex interpretations seem too daunting.

Recommendations for future research

A goal of this study was to address the barriers and concerns educators in the traditional setting face while implementing a socio-politically inclined CBPT in science. The hope was that educators who encounter its results will be able use its practical findings as a helpful tool in executing their own culture-based science lessons. Having addressed some of the concerns identified from previous literature, future studies may look into how the practical implications of this study

is utilized by an elementary science educator in the traditional setting. What difficulties and successes does an educator in the traditional setting face in utilizing the practices suggested by a study of a science teacher in an African-centered school?

Also, spirituality is an important part of Afrocentricity and African-centered education. This study did not focus highly on spirituality, mainly due to its aim of aligning CBPTs in mainstream schools with African-centered practices at an African-centered school. Many mainstream or traditional schools, being public, adhere to the separation of church and state; this means a distancing from spiritual topics or practices—especially those that, unlike yoga, have not gained secular acceptance. In working towards fully centering student identity, future research can look into practical ways in which the spirituality of people of African-descent—a very salient part of students' home lives and their communities—can also be recognized in the mainstream educational setting.

Lastly, this study focused on science instruction. However, educators struggle with interpretations of CBPTs in all subject areas, especially where the socio-political aspect is concerned. Future studies can look into the manifestation of an African-centered curriculum in Mathematics, English Language Arts, and Social Studies. A gaping void in the literature would also be addressed if future research can look into the manifestation of the African-centered philosophy in special area subjects such as physical education and the arts.

Conclusion

The findings of this study corroborated much of what was already reflected in previous literature regarding 1) the mindset of educators who successfully undertake this pedagogy, 2) the knowledge-base required to meaningfully execute this pedagogy, and 3) the practicalities of how this pedagogy must function in the classroom. All three require a high level of deliberate action

on an educator's part, which includes planning with the unique existence of African-descent students in mind. They also require an immense amount of consciousness on the educator's part that comes through his or her own constant research and education; one cannot teach an inclusive lesson on constellations if one does not know how other cultures regarded constellations, or whether other cultures even regarded constellations at all.

Science educators in the elementary setting, therefore, must note that putting CBPTs into practice is not a passive process that comes naturally, or without effort. As reflected in previous literature (Ladson-Billings, 2006; Codrington, 2014; Mutegi, 2011, 2013), educators firstly have to believe in the cause and the necessity of culture-based pedagogical theories in elementary science—which is that without such efforts, Black students do not see themselves as scientists, do not find the sciences engaging or productive, and, therefore, do not pursue the sciences in the future.

Also, because the centering of African-descent students' cultural identity is often in direct contrast with accepted classroom norms, there is an initial level of risk-taking involved on teacher's part. Elementary science educators must therefore take this risk and shed their own often subconscious perceptions about what science is, how it should be taught, and what should be taught. This includes being aware of the foundational quality of socio-political understandings at the elementary level—which functions to incite in younger students an inclusive way of seeing the world, the courage to question conventional scientific knowledge, and the freedom to engage in critical conversations that support their right to a liberatory science education.

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APPENDICES

Appendix A: Interview protocol

Interview protocol for semi-structured interviews with participants

Initial Interview

How does the Afrocentric framework inform your teaching practices?

What are the general tenets that you find are common throughout the curriculum?

What elements do you aim for consistently in your teaching practices?

What knowledge base do you find is necessary for the effective teaching in an African-centered classroom?

Tell me about your science curriculum.

Specific to observed lesson:

How did you visualize this lesson upon having to plan for it?

What were the important themes you wanted convey and why?

How did you see your role in this lesson?

What was the significance of this topic in the African-centered ambition, if there was any? How did you make it relevant if there wasn't?

Where were the evidences of student culture acknowledgement during your lesson?

Elaborate on moments when African-centered philosophical tenets were utilized during your lesson.